FLIGHT
The AIRCRAFT ENGINEER & AIRSHIPS

First Aero Weekly in the World

Founder and Editor: STANLEY SPOONER

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DIARY OF FORTHCOMING EVENTS.

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in the following list:

Dec. 16 — **Lectures, "Possible Developments of Aircraft Engines," by Mr. H. Ricardo, and "The Instalment of Aeroplane Engines," by Mr. A. J. Rowledge, before R.Ae.S., at Royal Society of Arts**

1921
Jan. 20 ... **Lecture, "The Cost of Air-Ton-Miles, compared with other Forms of Transport," by Lord Montagu of Beaulieu, before R.Ae.S.**

EDITORIAL COMMENT

THE Half-yearly Report on the Progress of Civil Aviation, which was recently issued as a Parliamentary Paper, forms interesting reading. It covers the period from April 1 to September 30, and for the purposes of examination may very well be divided into two parts—one relating to the progress made by other nations, and the other to things that have happened in this country during the period covered by Gen. Sykes' Report. Taking these in the order named, we find that a considerable amount of development has taken place abroad since the issue of the last Report. Practically every European country has apparently realised that aviation is the transport method of the future, and has taken steps, within its means, to encourage its development by all means possible. There is no need to traverse the work which is being done by any but the more important countries, and we shall, therefore, content ourselves with a brief glance at what these have done and are doing.

The Progress of Civil Aviation

We are already tolerably familiar with the progress which has been made in France under the beneficent system of encouragement pursued by the French Government. The Report says: "As a consequence of the subsidies granted to air transport companies carrying out regular services, a considerable number of air routes have been organised and are working regularly. Simultaneously, new air transport companies have sprung into existence, and the older concerns have concentrated their efforts by amalgamation. . . . Developments have not yet been attended by the evolution of new types of commercial aircraft."

True, there is not a great deal said in this, but what there is eloquent in justification of the policy of subsidies which is being followed by France. The main issue is that, as the Controller-General points out, "a considerable number" of new French air routes are being opened up, while here in England the one or two which are working are hard put to it to exist at all, while of encouragement to others to come in and establish new services there is next to none. None at all, in fact, so far as the Government is concerned.

* * *

Germany Going Ahead

It is when we turn to the record of progress made by our late enemy, Germany, that we confess ourselves disquieted by the facts disclosed by the Report. Gen. Sykes says: "In spite of the restrictions imposed by the Peace Treaty and the petrol shortage, civil aviation in Germany has progressed since the date of the last Report; air transport services have been opened, and German aircraft manufacturers have displayed considerable interest in the future possibilities of foreign markets. . . . With the object of assisting

the Luftministerium in its work and promoting the general development of the aviation industry, a number of air transport and aircraft manufacturing companies have formed an association called the 'Flug and Hafen' (Aviation and Airports), which is officially recognised by the Government. The Association has apparently assumed responsibility for the control of aerodromes, sheds, meteorological stations, signals, etc. . . . An announcement in the Press on the results of the first six months of civil aviation states that out of 1,532 flights 1,430 or 93·3 per cent. were successful, 347,595 miles were flown, and 1,574 passengers, 46,223 lbs. of mails, 126,864 lbs. of newspapers, and 11,241 lbs. of parcels were carried. . . . Representatives of German aircraft companies have appeared in the United States and the South American Republics in order to investigate opportunities for future exploitation. Experiments have been carried out in the United States with the Junker all-metal aeroplane, and, following a visit to America by directors of the Zeppelin constructing and operating companies, a number of American financiers are, according to reports in the American and German Press, negotiating with the Zeppelin interests with a view to the inauguration of an airship service between Europe and America."

Much of this we have heard before, but it is nevertheless interesting to have official confirmation now of what has hitherto simply passed current as unofficial news. We imagine that all who know anything about the subject will agree that Germany seems to be doing surprisingly well. The figures we have quoted, referring to the rapid growth of her air transport services, are excellent indeed, especially when it is remembered that she was forbidden by the Treaty to start active operations until about nine months ago, this being again postponed by reason of the Germans not having complied with the Allies' requirements as to delivering up of material and machines. She has, in fact, nevertheless, done almost as much as we have been able to do without any such hampering restrictions.

On the face of it, it would look as though Germans were more enterprising than ourselves, since it does not appear that the German Government is pursuing the same line of policy as that of France, and is not giving subsidies based on miles flown in commercial services. In fact, nothing concrete emerges as to subsidies at all. It seems, however, to be reasonably certain that the Government is doing something tangible in the way of encouragement. Gen. Sykes remarks in connection with the air services associated with the steamship companies that it "is understood" that they are receiving subsidies conditional on regular services being maintained. The subsidy in the case of the Deutsche Luftrederei he puts at 15½ million marks. However all this may be, the outstanding facts are that German civil aviation is going ahead very fast, while our own is standing practically still for want of a policy on the part of the Government.

There is little need for us to point the moral of where this is leading us. All that is necessary to be said is that all our war-leaders are unanimous in the opinion that the next great war will be inaugurated by a colossal attack from the air. Shall we be ready to meet it if and when it comes? Obviously not unless the present *laissez-faire* attitude of the Government towards aviation undergoes a radical change in the very near future.

Economy at Home

The Report adds little to the knowledge we already possessed of developments at home. What is more to the point are the "savings" which have been effected during the current financial year on civil aviation and research. Over half a million has been saved under the first head and some £800,000 under the second. We are completely in agreement with all proper economies in the public services, but such items as these call for the closest scrutiny.

It will be remembered by those who have closely followed the policy of the Government that the current Budget provided for the expenditure of a million pounds on civil aviation. Unfortunately, as we think, the guiding principle was adopted that expenditure should be estimated so as to procure the extension of general ground organisation both at home and on cross-Channel and Imperial air routes *should the development of civil aviation warrant it.*

There is a saving shown on this account of about £400,000, and in connection with this the Report says:

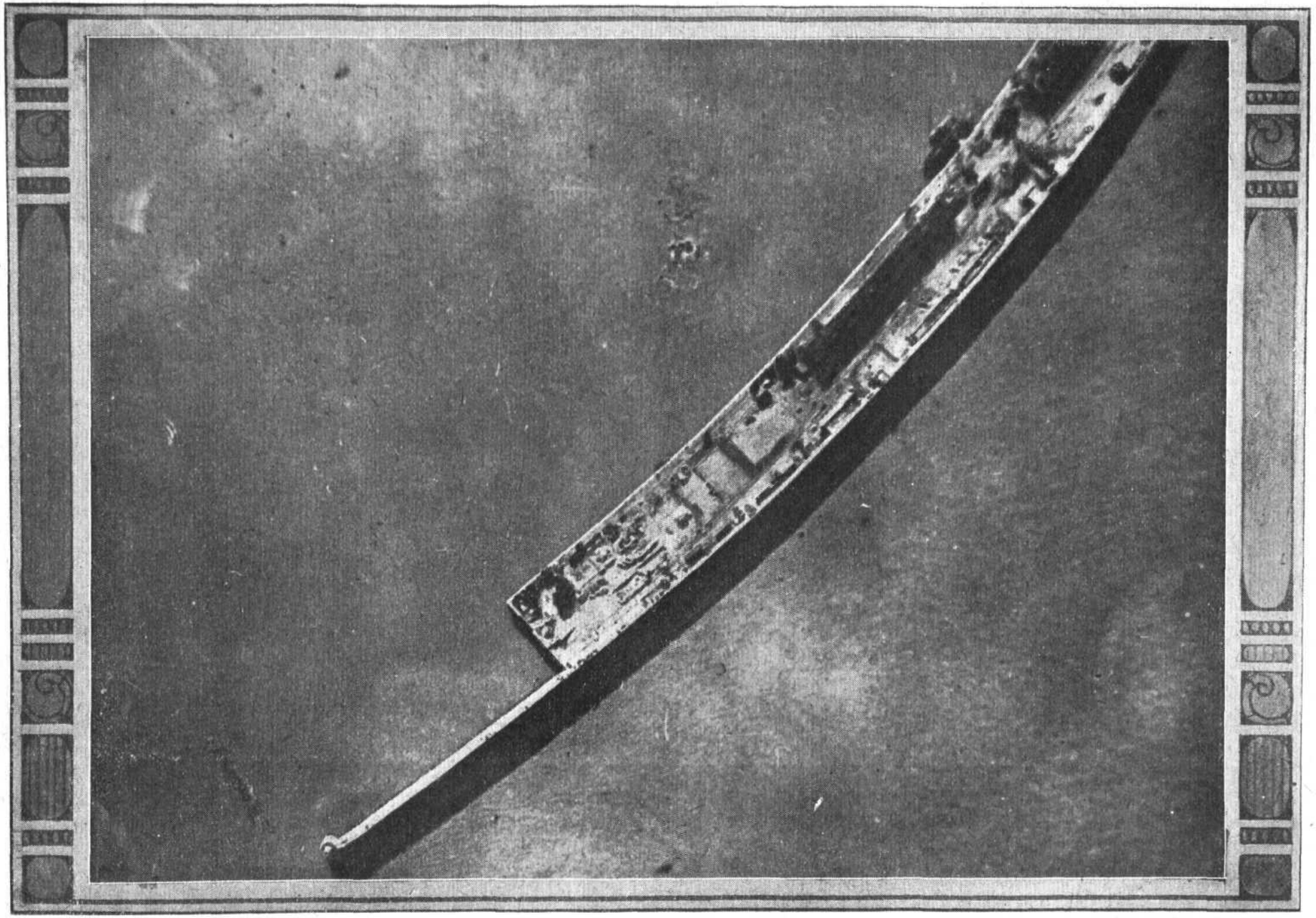
"Satisfactory as this result may appear from the point of view of economy, it is regrettable that the Department has no means of utilising its funds for purposes necessary to the development of air transport services but outside the scope of the items provided for in the Estimates."

Everybody concerned will feel disposed to re-echo this expression of opinion by the Controller-General. The development of civil aviation has not, we agree, warranted the expenditure of this money on ground organisation. It has been quite obvious for some time past that civil aviation cannot and will not develop as it should without initial assistance from the State.

It is, therefore, futile to think of spending money on ground organisation when there are no air transport services to take advantage of its facilities. The obvious course, then, to be taken is to re-examine the conditions, and, having in mind the success which has attended French aerial policy, to consider afresh the patent facts of the situation and divert at least a part of the sums allocated to civil aviation to some more direct scheme of encouragement. What that scheme should be has been sufficiently indicated in the reports of the Advisory Committee.

Again, we cannot agree that the saving on research work is warranted by the conditions. There is no need to stress the point that the Air Service will play a primary part in the wars of the future. That is a question upon which all are agreed. It follows as a matter of course that it is essential to the safety of the Empire that we should lead on the technical and scientific side of the movement and that money spent on the necessary investigation and research will be well expended.

Yet in what we conceive to be the two most vital directions of all we find considerable savings made on the Estimates, and we say without hesitation that it is wrong. We do not blame the Air Ministry. Its hands have been tied by the inelastic character of the Estimates, since it cannot, without Parliamentary sanction, spend its money in any other way than that laid down for it. Next year we hope to see the Estimates differently framed and the Government decided upon a definite line of policy. Then matters may progress more satisfactorily than is disclosed by the Report.



Travellers on the Handley Page London, Paris and Brussels Air Services have a unique view of the famous Mole at Zeebrugge, which is passed *en route* for Brussels. This photograph was taken from a height of 1,000 ft.

An Important Pronouncement

Mr. de Havilland, who is certainly among the foremost designers of the day, has recently in a letter to the Press made a most important contribution to our knowledge of the costs of carrying on a commercial aeroplane service. He says :—

"Aeroplanes can now do 5 ton-miles per gallon of petrol of net freight at 100 to 120 m.p.h. when filled up for a 350-mile journey. The initial cost of an aeroplane of this type at the present high prices is about £6,000, and its gross earning capacity at full load is between £150 and £200 per day. Depreciation was at first assumed to be 50 per cent. per annum. Experience has shown that 20 per cent. per annum is probably too high, and it is now obvious that the rate of depreciation and cost of upkeep can, in the near future, be made less per ton-mile than that for a motor lorry. These figures do not rely on a future type of aeroplane, but on one which has been in hard service for some months. It will be seen that the aeroplane is as economical as a motor lorry, and has at least 100 m.p.h. greater speed."

Coming from such an authority, we cannot do other than accept the figures as they are given. If they are to be substantiated—and we do not presume to question them—they open up a new vista to air transport. Hitherto it has been believed that the costs were much higher than he indicates, and give added weight to the pronouncement of another authority, Mr. Handley Page, that the time is fast coming when it will be possible to carry passengers between London and Paris for £5 and to transport goods over the same route at 6*d*. per lb. We see no reason to question either the stated facts or the point of view. We have to remember that for the past eighteen months the civil aviation companies have been to a great extent groping in the dark in the question of costs. They began as soon after the end of the War as was practical, with nothing but the costs of war flying to guide them, and these were, naturally, of very little value indeed. As a consequence it seems apparent that they placed their probable costs at too high a level, and are only now beginning to see where they stand in this vital direction. If it is indeed possible to run a service on Mr. de Havilland's estimated costs, civil aviation should develop much faster than at the moment seems probable. They are startling in their moderation.

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The Naval Construction Controversy

The controversy between the two opposing schools of naval thought regarding the question of capital ship *versus* submarine continues to occupy a great deal of attention generally. There is one aspect of the matter which we think is being somewhat neglected, and that is the part aircraft are destined to play in the sea wars of the future. It is true that the experts who are taking the greater part in the discussion are agreed that the aerial arm will play possibly even a great rôle in naval war, but there seems to be a danger that the controversy may concentrate too closely upon the respective virtues of the big surface ship and the submersible. If that should be, a mistake would ensue which would be fraught with the most serious consequences to the future of our naval power. It is argued that the lessons of the battle of Jutland are already out of date, and that it would be entirely wrong to base our programme of naval construction upon what was learnt as a result of what was really the first great clash between armoured fleets. If that is true—and we must accept the ruling of the naval experts—it is at least equally true that the lessons learnt from the employment of aircraft in conjunction with the fleets are just as obsolete. Indeed, it is arguable that they are even less reliable. We began the naval war with a close knowledge of the history of previous conflicts and their lessons. Naval construction had followed a continuous line of development and had culminated in the embodiment in ship construction of all the knowledge acquired in war and peace since the launch of the *Warrior*, the first armoured ship which figured in the Navy List.

On the other hand, aircraft had not emerged from the stage of swaddling clothes. Machines themselves were under-powered and unreliable in performance. Their radius of action was almost literally as restricted as the limits of human vision. No one knew what their exact relation was to the other arms, or how best they could be employed. In a word, their possibilities were a sealed book to all. Development during the War was exceedingly rapid, and the aircraft of 1918 were very different indeed from those of 1914. The scheme of employment, if we may call it such, had undergone almost as great a process of development, but it would be dangerous to the last degree to assume that the ultimate lessons were learnt.

We know we are treading on dangerous ground when we presume to repeat that in wars of the future the air will be the decisive factor, but in again expressing such an opinion we find ourselves in good company. Lord Fisher held that opinion. So does Sir Percy Scott and many others almost equally distinguished. Rear-Admiral S. S. Hall says, for example, and very definitely, that : "A naval policy based upon aircraft and submarines affords us *the only hope* of protecting our trade—the main purpose of our fleet. . . . Such a policy will save us many millions on other estimates besides the naval ones, and will ensure us a reasonable hope of command of the air in the next war, *without which all effort will be futile.*" This is indeed to the point, and should give the advocates of the big surface ship furiously to think.

The question which it seems to us falls most to be discussed is : Can the big surface ship survive against the attack of the submersible from below the sea and of aircraft from above, always bearing in mind that both the latter are a long way from the culminating point of development ? That is the main issue, but there are others which hang to it and must be settled collaterally before we can get to a decision on policy. In fact, we take the view that the question must be settled as much in relation to the problem of aircraft as to that of the submarine.

▣ ▣

No Acrobatics in Switzerland

THE Swiss Air Ministry, which some time ago issued a ban on stunting, has announced that, following a new decision of the Government, permits will not be granted in future for any meeting the programme of which includes acrobatic flights.

A New R.E.P. Motor

WORD comes from Paris that, in view of the possibilities of a Round-the-world flight being held next year, M. Robert Esnault-Pelterie is busily engaged upon the production of a new motor, designed upon novel lines for long flights.

▣ ▣

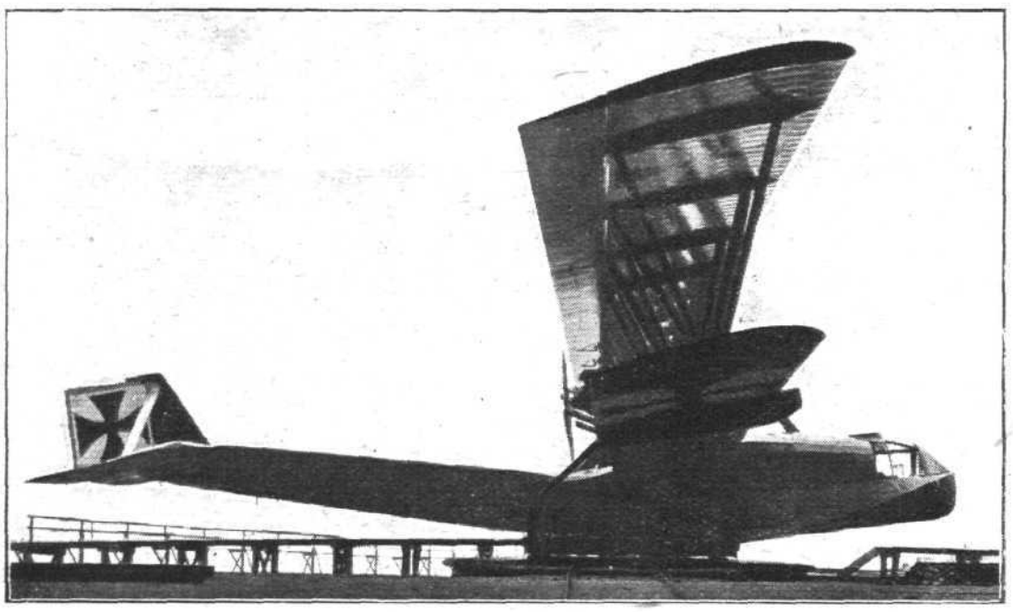
Sadi Gets in Front Again

FLYING one of the Gordon-Bennett Nieuports, modified however, to the extent that the pilot is now entirely enclosed when flying, Sadi Lacointe on December 12 succeeded in beating the speed record of 309.012 kiloms. per hour set up a month ago by de Roumanet on a Spad. Flying at Villacoublay and keeping within about three metres of the ground, he covered the kilometre in one direction at a speed of 321.428 kiloms. per hour, while his average for the kilometre, flown in two directions, worked out to 313.032 kiloms (just over 194 miles) per hour.

FLIGHT

SOME DORNIER "MILESTONES"

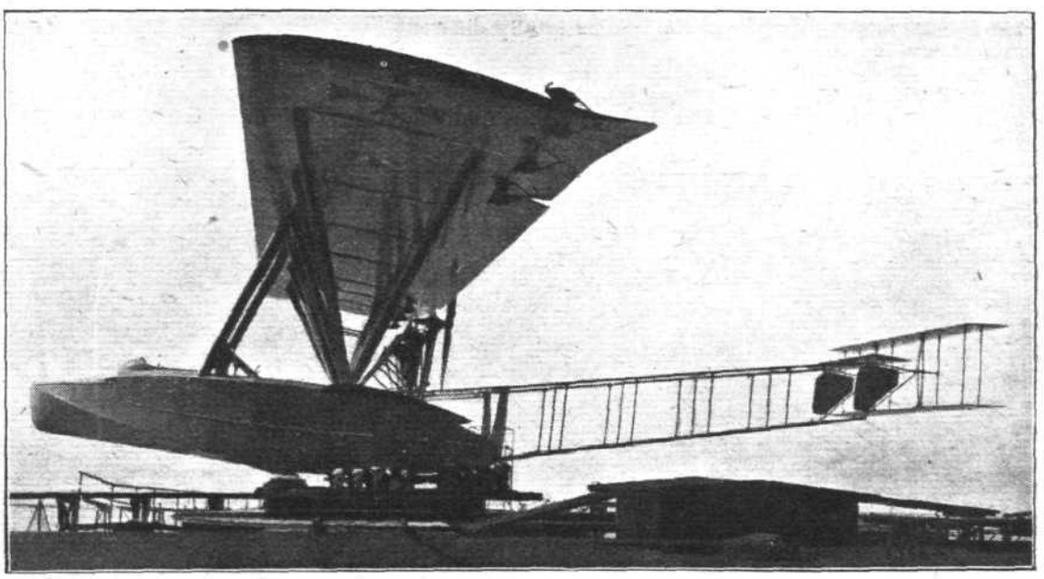
THE question of metal construction is now generally admitted to be one of great importance to the development of commercial aviation. Not only does it appear that for the same weight greater strength can be provided in metal aircraft structures, but also the question of durability, which is of far greater importance in commercial aircraft than in war machines which do not as a rule in any case have a very long life, seems to point to metal as a more satisfactory solution. In Germany a great deal of work has been done in the way of metal construction, most of which is already fairly well known in this country. Thus the various Junkers machines, A.E.G.'s, Zeppelin-Staakens, etc., have been examined and described from time to time. There is, however, one German designer whose work, although it extends over a period of about six years, is not so well known in this country as it deserves to be. We refer to that of Herr Dornier, who is one of the chief designers of the Zeppelin firm. We understand that already early in the War, Herr Dornier was engaged upon the design of all-metal machines of large size, but it was realised by those in charge of the Zeppelin concern that the work was of such a nature that immediate results could not be expected. Consequently, another of the firm's designers, Professor Baumann, was entrusted with the task of designing war machines of more or less orthodox type, while Herr Dornier was allowed to go on along his special lines, his work being regarded as more or less experimental and not expected to result in machines for use during the War. This probably explains the reason for the comparatively scant knowledge of the Dornier-Zeppelins while the Baumann-Zeppelins (Staakens) are well known. As the Dornier machines are of very unorthodox design and appear to promise well for commercial work, we have thought that a few notes and illustrations dealing wth some of his productions built at the Lindau works may not be without interest.



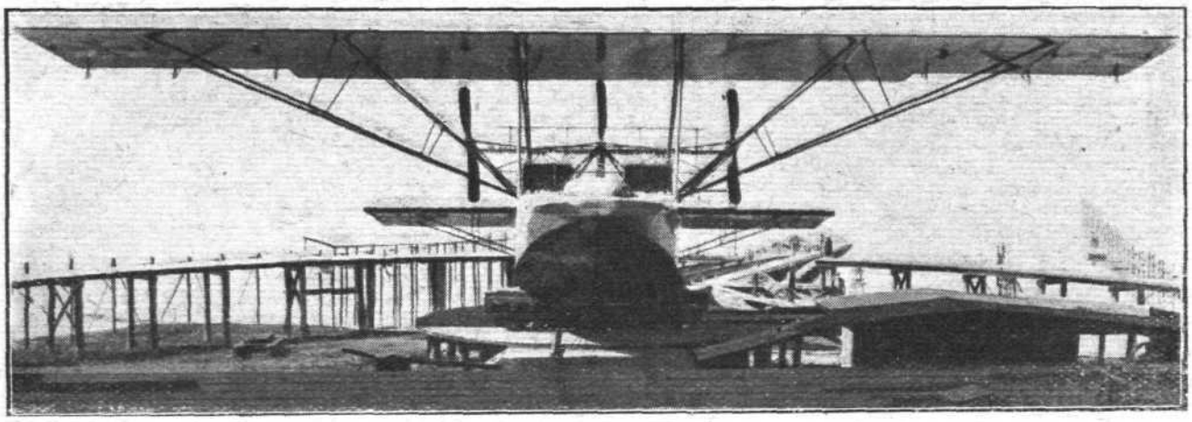
The Do. Rs. I: This machine is the first of the Dornier series of Zeppelin flying boats, and has biplane wings. All his subsequent flying boats were monoplanes.

The Do. Rs. I—1914-15

The first machine, which was turned out during the years 1914 and 1915, was a biplane flying boat with the lower plane considerably smaller than the top, or as the Germans call it a one-and-a-half plane. The inter-plane bracing took the form of a series of vee steel struts forming a Warren truss as viewed from in front. The hull was of orthodox design vee-bottom front portion and a single step, with the aft portion cocked up at an angle and carrying the tail. Wing tip floats were fitted, but in the next and all subsequent models these were discarded in favour of short wing stumps projecting from the sides of the boat and providing lateral stability without the use of wing tip floats. The power plant consisted of three 240 h.p. Maybach engines. The machine had a span of 143 ft. 6 ins., a length of 96 ft., and a total wing area of 3,540 sq. ft. The machine was thus a very large one,

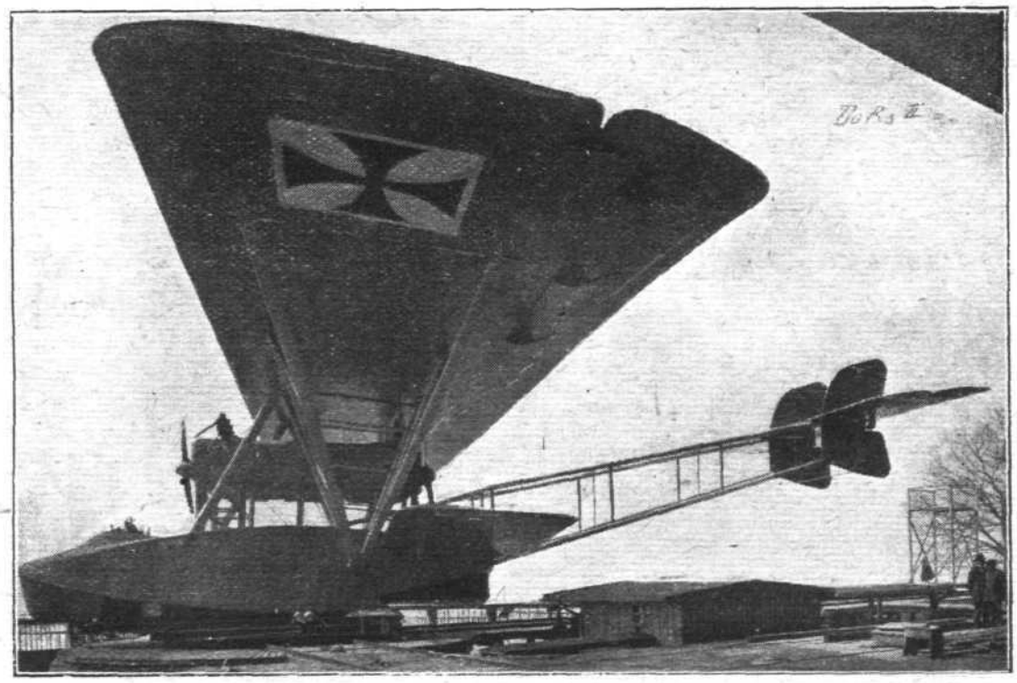


The Do. Rs. II: Side view, showing open tail girder.



The Do. Rs. II : This machine had the engines placed in the hull and transmission drive to three pusher airscrews. Note the wing roots on the boat and the strut bracing.

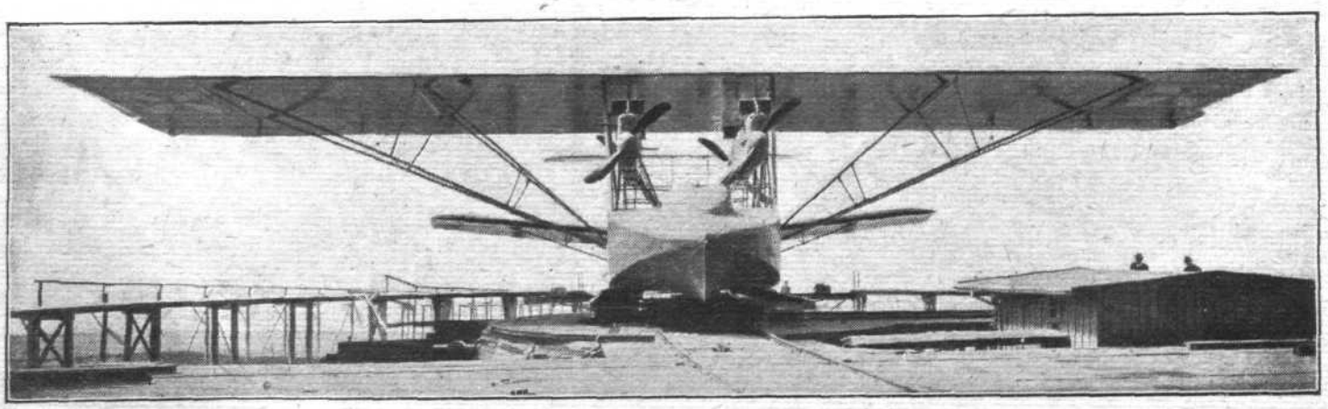
especially considering that she was designed in 1914. Unfortunately no figures of wing and power loading are available, nor data relating to her performance. The latter must, however, have been such as to warrant going on with the experiments, although the next model was totally different in its general lay-out.



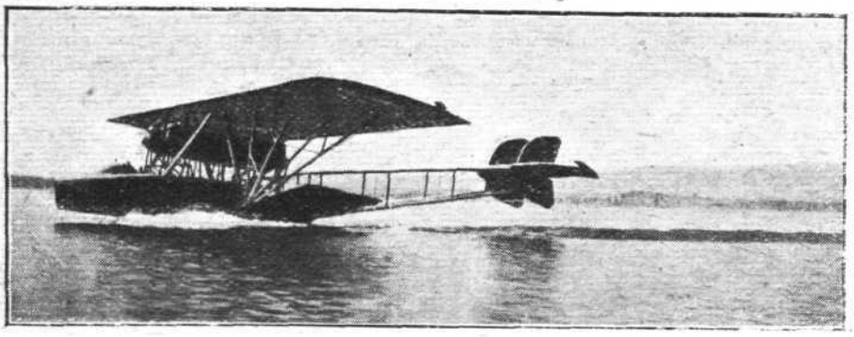
The Do. Rs. IIa: Side view.

The Do. Rs. II and Rs. IIa, 1915-16

As will be seen from the accompanying photographs, the Rs. II, as the next type was called, has a short boat hull, not altogether unlike that of the Sopwith "Bat boat." The tail planes are carried on outriggers from the main hull, and comprise a biplane tail, with a small elevator placed between and slightly ahead of it, and of twin balanced rudders. The top main plane shows much the same arrangement as that of the previous model, but the lower plane has shrunk still further and is, in fact, reduced to two short wing stumps attached to the boat hull, from which it is braced by sloping tubes. The short span of these wing roots necessitated a

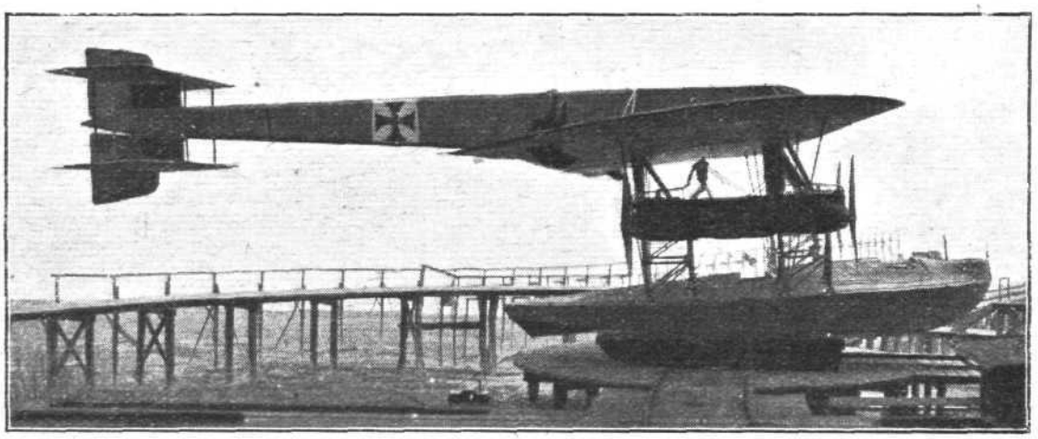


The Do. Rs. IIa : This machine is a development of the Rs. II, and has the engines placed above the hull, with direct drive to the airscrews.



The Do. Rs. IIa getting off : Note the absence of spray.

slight alteration in the wing bracing, the tubular vee-struts being carried inwards to the top rails of the boat, instead of forming, in front view, a Warren truss, as did those of the Do. Rs. I. The power plant consisted of four 240 h.p. Maybach engines, placed in the hull and driving three pusher air-screws. Whether because of transmission difficulties, or on account of the extremely low c.g. in relation to the monoplane wing is impossible to say, but the fact remains that after a few experiments this arrangement was discarded in favour of direct drive, with the four engines placed on steel structures between the wing and the top of the boat. This model was, we believe, known as the Do. Rs. IIa, as it was, generally



The Do. Rs. III : In this machine the tail is carried on a *fuselage* placed above the wing.

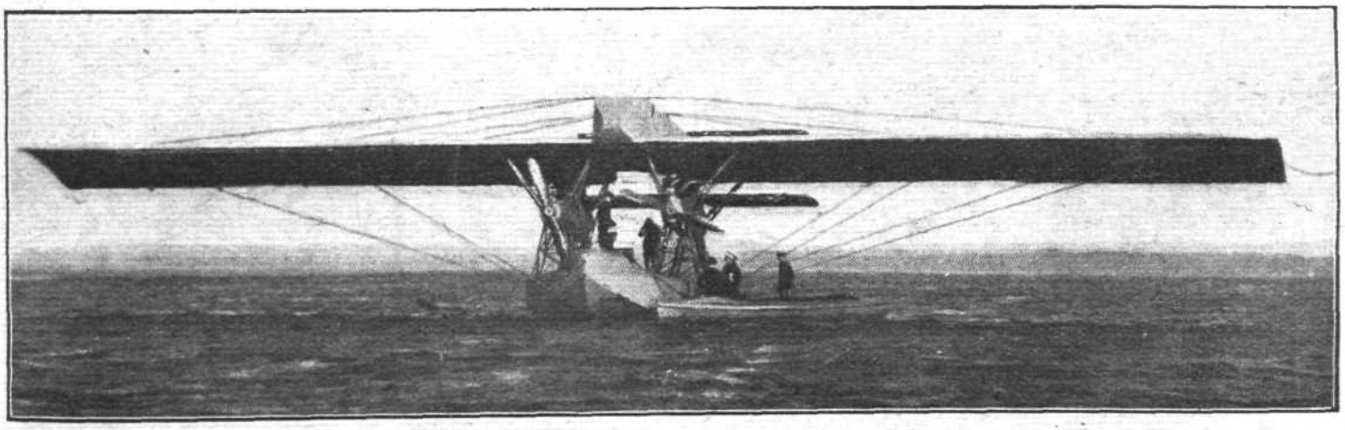
speaking, similar to the Rs. II. The tail outriggers are, however, shorter and carry a monoplane tail plane, with a balanced elevator. There are also in this type two fixed vertical fins, the " above-and-below " rudders being balanced by small projections working in cut-out portions of the fins. The boat hull is, it will be seen, very wide, and appears to give very little spray, as shown in the photograph of the machine taking off. It is worthy of note that this hull has a vee-bottom in front of the step, while aft of the step the vee-bottom is broken in the centre by a box-like projection, not unlike those found on several French Nieuport seaplanes. The lower wing roots, it will be seen, are placed well aft on the hull, their trailing edge being aft of the stern, and they are given a very pronounced dihedral angle. We regret that no data are available regarding the size and weights of this machines.

The Do. Rs. III, 1916-17

The next machine in the series of Dornier flying boats was the Rs. III, in which the four 260 h.p. Maybach engines were again placed between the wing and the boat hull. The tail planes were, however, carried on a *fuselage* resting on the *top* of the monoplane wing, this *fuselage* being totally covered in. The tail, incidentally, was of the biplane form, and there were no lower wing roots. In their place lateral stability on the sea was obtained by making the boat hull very wide, although shallow. The wing bracing was also changed, strut bracing being discarded in favour of cable bracing. Possibly the adoption of the covered-in *fuselage* above the wings aimed at improving the lateral stability of the machine in the air, by providing lateral fin surface above the c.g. It might be mentioned that a similar arrangement was suggested either immediately before or during the first part of the War by Herr Ursinus, Editor of the German aviation journal ***Flugsport***.

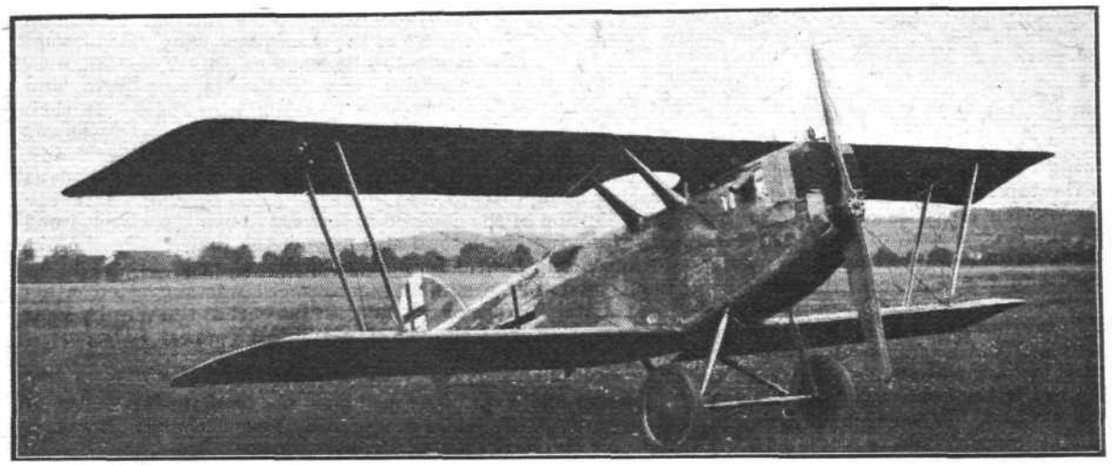
The Do. C. I, 1917

During the year 1917 a break occurred in the series of monoplane flying boats designed by Herr Dornier. By way, it is believed, of gaining some experience with metal *fuselage* covering to act at the same time as *fuselage* bracing, a land machine, known as the Do. C. I, was designed and constructed. This was a single-engined tractor biplane with a 160 h.p. Mercédès engine. As the accompanying photograph will show, the Do. C. I was a very clean-looking job, and from a constructional point of view was chiefly remarkable as being the first instance of plain, smooth metal body covering acting at the same time as *fuselage* bracing. The wings were of ordinary construction, except for the metal spars shown in our diagram. As distinct from the majority of German machines it had a nose radiator, and altogether it looks much more like

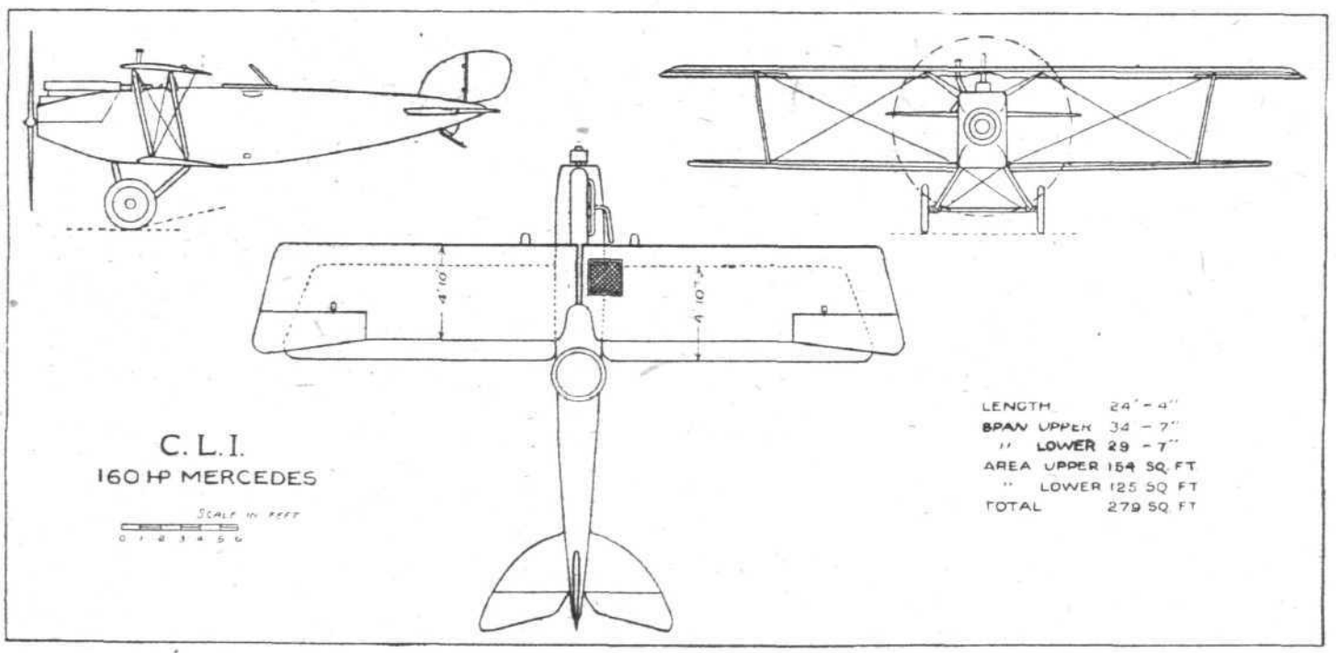


The Do. Rs. III : Front View.

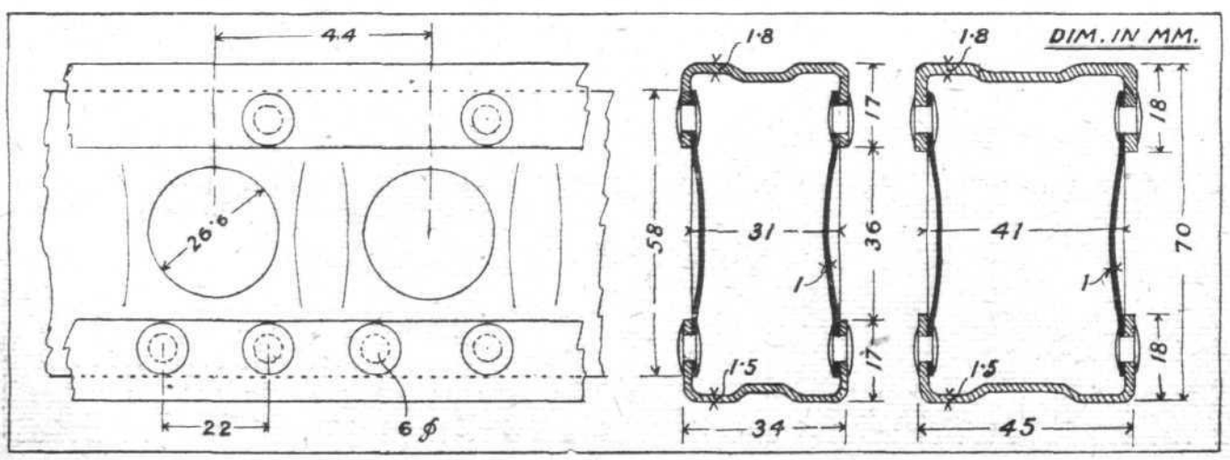
an English than a German aeroplane. The top plane centre section is carried, not on a *cabane* as is usual German practice, but on outwardly raked struts of sheet metal, designed to give sufficient rigidity without wire bracing, thus leaving the space between the centre section and the top of the *fuselage* free of obstructions. One might wonder why such a machine was not turned out in quantities, as it certainly *appears* to be far ahead of any contemporaneous German aeroplane familiar at the front at that time. The explanation is that the metal construction was so heavy as to reduce the performance, which failed, we understand, to come up to the required standard of climb. A small general arrangement drawing of the Do. C. I, or Zep. C.L. I as it is sometimes called, is published herewith. Also the climb recorded on a test flight on March 18, 1918. It will be seen that an altitude of just under 5,000 metres (16,500 ft.) was reached in one hour. The time allowed for this class of machine is 45 minutes, so that the Zep. C.L. I fell short of the requirements by 15 minutes. Up to an altitude of 4,000 metres it was almost up to requirements, but the last 1,000 metres, instead of occupying 16 minutes, took half-an-hour. It is thought that the following tables of weights, etc. of the C.L.I. may be of interest:



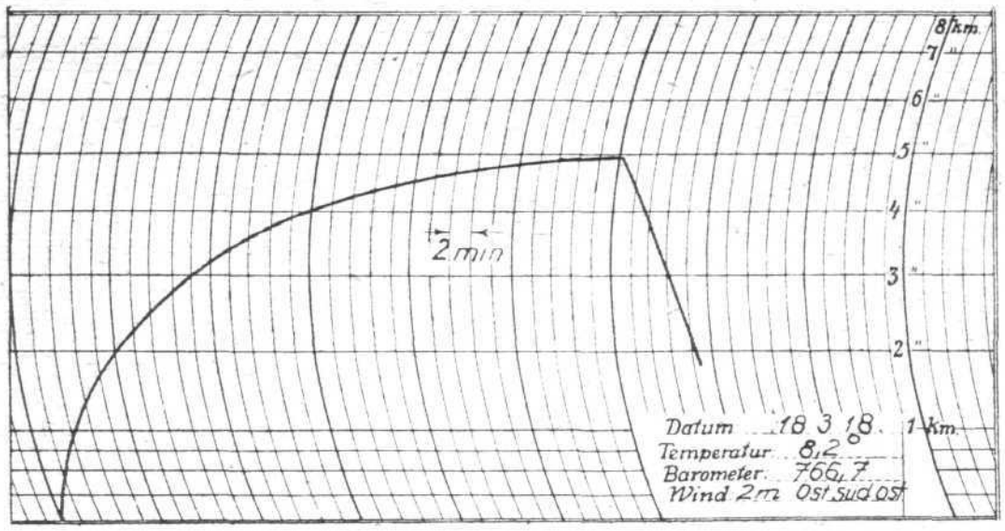
The Do.C.I: This machine was the first to employ smooth metal covering of the *fuselage* without internal bracing.



THE DO. C.I OR ZEPPELIN C.L. I: Plan, side and front elevations to scale.



THE DO. C. I: Sections, etc., of the metal spars.



Climb Chart of the Do. C.I : The climb during the last 1,000 metres fell short of requirements.

Table of Item Weights of Zep. C.L.I.

	lbs.
160 h.p. Mercédès engine (including 8 litres of oil in crank case)	642.0
Exhaust collectors	13.2
Engine starter	6.2
Radiator (empty)	48.4
Cooling water (23 litres)	50.6
Air-screw	41.8
Petrol tank and fixings	30.8
Oil tank	6.6
Engine accessories, instruments, controls, etc.	48.4
Total	888.0
Fuselage (including tail plane and fins)	288.0
Seats, controls, etc.	60.5
Undercarriage	108.0
Main planes, including flaps and bracing	198.0
Rudder and elevators	12.5
Fittings for armament, etc.	46.2
Total	713.2
Total weight empty	1,601.2

Useful load :	lbs.
Pilot and gunner	360.0
Two machine guns and ammunition	144.0
Three hours' fuel (160 litres petrol, 11 litres oil)	239.0
Total	743.0
Weight fully loaded	2,344.2
Wing area	278 sq. ft.
Load per sq. ft.	8.4 lbs.
Load per h.p.	14.6 "
Climb to 16,500 ft.	1 hour.

We have devoted a considerable amount of space to this machine, since it was probably the first to be built with no form of *fuselage* bracing beyond that afforded by the plain sheet metal covering. Although the machine failed by a relatively small margin to come up to the German Government specification for performance, there can be little doubt that it taught Herr Dornier many a valuable lesson of which he later made use in designing other all-metal machines.

(To be Concluded)

THE GOLDER'S GREEN SMASH

We deplore the bad accident to the Handley Page at Golder's Green on Tuesday last, which has to be recorded. At the time of going to Press no official details of the cause have been issued, and it is very doubtful if any definite reason will be evolved. It would appear that there was nothing wrong with the machine itself, and that the mist which prevailed must have been primarily responsible for the disaster, as it was difficult to see the leafless tree which, without question, started the crash. Whether the pilot did not realise his rate of climb, or not, will never be known, but it is a double calamity that such an unfortunate occurrence should have come just now to mar the marvellous flying record of the H. P. services, hitherto without a serious accident of any sort. It should be realised that this compares enormously in favour of aviation for security with any other form of existing locomotion. In fact, merely to take the nearest home simile, street traffic accidents would probably be in the ratio of 100 to 1.

The following official statement was made yesterday by Messrs. Handley Page :—

" One of our passenger-carrying aeroplanes, shortly after it left our aerodrome for Paris at noon to-day, crashed to the ground in the vicinity of Cricklewood.

" Four persons were killed—the pilot, Mr. R. Bager, the mechanic, Mr. J. H. Williams, who were killed instantaneously ; and two passengers succumbed to their injuries—Mr. S. Salinger and Mr. Vander Elst. Of the remaining four passengers, two were only slightly injured. The others were quite unhurt and returned home.

" The cause of the accident has not yet been ascertained. This is the first disaster which has occurred in connection with the Handley Page air services between London, Paris, Brussels and Amsterdam since December, 1919, when the service was first organised. During this period over 4,000 passengers have been safely carried to their destinations, the total mileage being over 320,000 miles."

NOTICE TO AIRMEN

135 Aerodrome List Amendments (238786/20).

NOTICE to Airmen No. 106 (Consolidated List of Aerodromes), October 1, 1920, is amended as follows :—

LIST C.—*Licensed Civil Aerodromes.* (*a*) *Civil Aerodromes licensed for all types*

The following should be deleted :—

Name	Aerodrome Lat.	Long.	Height above sea level
Eastbourne..	50° 48′ 0″ N.	0° 18′ 0″ E.	15 ft.

Pilots are warned that this aerodrome, in addition to having ceased to be a licensed civil aerodrome, is in process of demolition, and that it is unsafe for machines to land there.

N.A.C.B.'s New Title

IT is officially announced that from January 1 next year the title of the Navy and Army Canteen Board organisation will be changed to " Navy, Army, and Air Force Institute."

No. 6 Wing R.N.A.S.

AT the Connaught Rooms on December 8, the second of the annual dinners of the late No. 6 Wing, R.N.A.S., was held. Forty-three of the members who were with the Wing in Italy attended. Major J. Morrison presided, a fact which assured the success of the dinner from the first. Speeches in the reminiscent vein were made by Admiral Mark-Kerr and Admiral Murray Sueter, Wing Commdr. Beuttler, Wing Commdr. Cortis Stamford, Sqdn.-Leader Conway Pulford, and Sqdn.-Leader W. H. Mackenzie.

Vice-Admiral Kelly sent a message of regret for his inability to attend, and congratulations and remembrances to members of the Wing.

THE ROYAL AERO CLUB OF THE U.K.

OFFICIAL NOTICES TO MEMBERS

Official World's Records Passed by the Fédération Aéronautique Internationale, January 6 to October 20, 1920.

CLASS C (FLYING MACHINES)

No. 1. DURATION: (*Returning to the point of departure without alighting*).

L. Boussoutrot and Jean Bernard: Villesauvage-La Marmogne. June 3-4, 1920. Farman "Goliath," 2-260 h.p. Salmson .. .. .. 24 h. 19 m. 7 s.

No. 2. DISTANCE: (*Returning to the point of departure without alighting*).

L. Boussoutrot and J. Bernard: Villesauvage-La Marmogne. June 3-4, 1920. Farman "Goliath," 2-260 h.p. Salmson .. .. .. 1,915·2 Kilometres.

No. 3. HEIGHT: (*Returning to the point of departure without alighting*).

R. W. Schroeder: Dayton, Ohio. February 27, 1920. Le Père Biplane, 400 h.p. Le Père .. .. .. 10,093 Metres.

No. 4. SPEED: (*a*) *Speed over a Given Distance.* (*Returning to the point of departure.*)

100 *Kilometres*:

B. de Romanet: Villesauvage-Gidy. September 25, 1920. Spad-Herbemont, 300 h.p. Hispano-Suiza .. .. 23 m. 16⅕ s.

G. Kirsch: Villesauvage-Gidy. September 25, 1920. Nieuport, 300 h.p. Hispano-Suiza .. .. .. 22 m. 18 s.

Sadi Lecointe: Villesauvage-Gidy. September 25, 1920. Nieuport, 300 h.p. Hispano-Suiza .. .. 21 m. 28 s.

200 *Kilometres*:

G. Kirsch: Villesauvage-Gidy. September 28, 1920. Nieuport, 300 h.p. Hispano-Suiza .. .. .. 48 m. 52⅖ s.

B. de Romanet: Villesauvage-Gidy. September 28, 1920. Spad-Herbemont, 300 h.p. Hispano-Suiza .. .. 46 m. 7 s.

Sadi Lecointe: Villesauvage-Gidy. September 28, 1920. Nieuport, 300 h.p. Hispano-Suiza .. .. 43 m. 42⅗ s.

1,000 *Kilometres*:

L. Boussoutrot and Jean Bernard: Villesauvage-La Marmogne. June 3-4, 1920. Farman "Goliath," 2-260 h.p. Salmson .. .. .. 10 h. 19 m. 46 s.

1,500 *Kilometres*:

L. Boussoutrot and Jean Bernard: Villesauvage-La Marmogne. June 3-4, 1920. Farman "Goliath," 2-260 h.p. Salmson .. .. .. 16 h. 42 m. 8 s.

(*b*) *Greatest speed per hour.* (*Over a straight-line course of 1 Kilometre.*)

Sadi Lecointe: Villacoublay. February 7, 1920. Nieuport, 300 h.p. Hispano-Suiza .. .. .. 275·862 Kilometres.

Jean Casale: Villacoublay. February 28, 1920. Spad-Herbemont Biplane, 300 h.p. Hispano-Suiza .. .. 283·464 Kilometres.

B. de Romanet: Buc. October 9, 1920. Spad-Herbemont, 300 h.p. Hispano-Suiza .. .. .. 292·682 Kilometres.

Sadi Lecointe: Buc. October 10, 1920. Nieuport, 300 h.p. Hispano-Suiza .. .. 296·694 Kilometres.

Sadi Lecointe: Villacoublay. October 20, 1920. Nieuport, 300 h.p. Hispano-Suiza .. .. .. 302·529 Kilometres.

No. 5. USEFUL LOAD TRANSPORTED.

Duration, 1,500 *Kilogrammes*.

G. T. R. Hill: Cricklewood. May 4, 1920. Handley Page W. 8, 2-450 h.p. Napier "Lion" .. .. .. 1 h. 20 m.

Height: 1,500 *Kilogrammes*.

G. T. R. Hill: Cricklewood. May 4, 1920. Handley Page W. 8, 2-450 h.p. Napier "Lion" .. .. .. 4,267 metres.

Offices: THE ROYAL AERO CLUB,
3, CLIFFORD STREET, LONDON, W. 1.
H. E. PERRIN, Secretary.

SUPPLEMENTARY AIR ESTIMATES

FROM a supplementary estimate issued on December 10, it appears that a further sum of £1,935,300 is required for the Air Service for the year ending March 31, 1921. Authority is also sought from Parliament for the utilisation of surpluses on certain Air Votes, including excess appropriations in aid, amounting to £2,050,800. The items in the estimate are the cost of the formation of five additional squadrons, with their ancillary establishments, the cost of certain new works services, the grant of outfit allowances to certain classes of officers, the meeting of deficits on other Air Votes, and also for the increase in the total estimated cost of improvements to regimental and other temporary accommodation. The following is a summary of the figures:—

	£	£
Estimated cost of the formation of five additional squadrons, etc.	267,000	
Estimated cost of new works services ..	141,550	
Estimated cost of outfit allowances ..	37,300	
Total deficits	3,540,250	
		3,986,100
Total surpluses	1,613,400	
Excess appropriations in aid	437,400	
		2,050,800
Supplementary estimate required		£1,935,300

A statement showing the amounts already voted, and the revised totals for the year 1920–21, is given. Nine votes are included, and the aggregate figures are:—

	Gross Total.	Appropriations in aid.	Net Total.
	£	£	£
Original estimate ..	22,829,619	1,772,689	21,056,930
Supplementary estimate now presented ..	2,372,700	437,400	1,935,300
Revised estimate ..	25,202,319	2,210,089	22,992,230

The supplementary vote for Air Services consequently arises solely from these arrears of past expenditure on War contracts, and on the actual expenditure of the present year, in spite of certain additions, there is a substantial net saving.

In an explanatory memorandum it is pointed out that the Air Ministry has during the year effected a number of savings and under-spendings on its votes which, together with additional credits, aggregate £2,050,800. The savings were sufficient not only to pay for the additional expense involved in raising the five extra squadrons authorised by the Cabinet in July last, and other minor additions, but also to yield a surplus to the Exchequer of approximately £1,500,000. So far, therefore, as the expenditure of the present financial year is concerned, there has been a substantial net saving on Air Ministry votes. This situation has been reversed by an additional charge due by the Air Ministry to the Ministry of Munitions in respect of the liquidation of War-time contracts. To meet all such charges a total sum of £3,250,000 was taken in the original Air Ministry estimates for this year. This has proved insufficient, the total charges for the year being well over £6,000,000. It has been decided that, although the extra charge of approximately £3,000,000 has already been paid by the Ministry of Munitions in 1919–20, it should be borne on the votes of the Air Ministry for 1920–21, and credited to the Ministry of Munitions, and that it is not a proper subject for an excess vote on the estimate for 1919–20.

▣ ▣ ▣ ▣

Signal Experiments at Croydon

WHAT appeared from the outside of the aerodrome to be a firework display was held at Croydon on December 9. As a matter of fact it was a series of demonstrations and tests with rockets, star and smoke shells, parachute lights, etc., designed to facilitate landing at night or in a fog.

FLIGHT

CIVIL AVIATION.—APRIL 1–SEPTEMBER 30, 1920

THE third half-yearly report on the "Progress of Civil Aviation," covering the period from April 1 to September 30, 1920, signed by Sir F. H. Sykes, Controller-General of Civil Aviation, has been issued as a White Paper. Space does not permit of the Report being reproduced in full in these pages, but a summary of the chief items is given below :—

International.—While several of the minor States have ratified the International Air Convention, general ratification has not yet taken place, but temporary agreements have been negotiated with Norway, Sweden and Denmark and Finland ; these have not yet been signed. Monthly conferences have been instituted with the French and Belgian air authorities in order to discuss all matters in connection with civil aviation affecting them, pending the establishment of the International Commission of Aerial Navigation.

Commercial Services.—On the regular services established from London to Paris, to Brussels and to Amsterdam, passenger, mail and goods traffic increased substantial y compared with previous periods. Amsterdam has been the junction for air lines to Germany and the Scandinavian countries. The total number of machine miles, 689,600, is an enormous increase on the figure for the previous six months.

It is interesting to note also that the aggregate machine mileage since May, 1919, is well over a million miles. Similarly, the number of passengers carried has been greatly increased, 32,345 having been carried. Goods have increased from 25¾ tons to 86½ tons, while the number of departures and arrivals to and from the continent has risen from 734 to 2,445, the value of imports from £131,615 to £376,606, and of exports from £63,743 to £168,300.

The number of letters carried since the inauguration of the mail service shows a steady increase, especially on the London-Amsterdam service, and an efficiency of 76 per cent., 94 per cent. and 84 per cent. each has been obtained on the London-Paris, London-Brussels and London-Amsterdam services respectively.

Organisation.—The Board of Customs and Excise has agreed to grant Customs facilities for seaplanes and flying boats at certain ports on the S.E. Coast, and, with the consent of the Admiralty, it is hoped to include an air port on the Medway. In addition, negotiations have been continued for the use of the Thames above Westminster Bridge by aircraft employed on mail service and other traffic.

The experimental lighthouse at Croydon has proved of value to belated machines landing after dark. Two more experimental lighthouses are to be installed, one at Lympne and one midway between London and Folkestone. The civil aerodromes at Castle Bromwich, Manchester and Renfrew will be similarly equipped, when the volume of night traffic renders this desirable.

The wireless direction-finder apparatus installed at Croydon has proved its value, enabling aircraft to correct their course in thick weather ; and the equipment of aircraft with the wireless telephone is extending as it is found to be of considerable assistance to navigation. Electric landing lights for indicating the direction for landing are being installed at Croydon Aerodrome, and trials are being made at the same aerodrome to test the value of powerful searchlights as a means of helping to locate the aerodrome.

The installation of wireless stations for telephony and telegraphy has been continued, and stations are now open at Croydon, Lympne, Castle Bromwich, Manchester and Renfrew. The British proposals for the new Radio-Telegraph and Telephone Convention, including all forms of communication to and from aircraft, have been framed. and these are now being considered by an International Conference at Washington.

Pilots, etc., and Machines.—Revised regulations governing the issue of certificates to aerial navigators and pilots have been drawn up and arrangements made for the technical examination in navigation of civilian pilots. These navigation tests will be strictly enforced in future.

Medical Services.—It is now possible to begin to judge the effect of continuous civil flying on those engaged in the regular continental services, or on other continuous air work. It is interesting to note that the physical condition of the pilot so employed compares favourably with that of the selected University athlete, or of the candidate for a commission in the R.A.F.

Research.—Experiments have been conducted by the Department of Research into the development of several new types of power plant, and, if these are successful, it will enable a fuel of a higher flash point to be used, thus making for safety and cheapness. Several new designs of aircraft are being produced with facilities for making adjustments to the engines during flight ; and a satisfactory engine starter for use on the ground is now available.

Other investigations have been carried out to minimise the effects of mist and fog by mechanical dispersal, to secure the illumination of landing grounds, and to produce mechanical apparatus to cause machines to flatten out automatically just before touching the ground, as well as into the question of obtaining instruments for indicating accurately to the pilot his position in relation to the aerodrome and his height above the ground. Among other problems under consideration are those connected with the all-metal machine, helicopter, amphibian, and various instruments for night flying.

Airships.—The Research Department is carrying out investigations in technical details affecting the possible future operation of airships in dry climates (Egypt), while an improved mooring mast is to be erected in order to carry out further tests in mooring airships.

Expenditure.—The Budget provided for an expenditure of one million pounds in aid of civil aviation during the present year. When the estimates were drawn up it was adopted as a guiding principle that expenditure should be estimated so as to procure the extension of general ground organisation both in this country and on cross-Channel and Imperial air routes should the development of civil aviation warrant it.

The total estimated saving in the estimates amounts to about £400,000.

Imperial Air Routes.—On the England-Egypt route a site has been secured at Malta for a new aerodrome, and steps have been taken to ensure the wireless communications along the air route between England, Malta, Egypt, Mesopotamia and India. The preparation of the Egypt-India route has been delayed owing to the unsettled conditions prevailing in Mesopotamia and Persia. Arrangements are being made whereby the maintenance of the aerodromes on the Cairo-Cape Town route will be borne by local governments ; this will relieve the British Government of financial responsibility.

Dominions.—In Australia several air routes have been surveyed, and various schemes for the organisation of new air services between the principal towns are under consideration. In Canada a Government civil aerodrome has been opened at Ottawa, and a seaplane station at Vancouver is nearing completion. All regular Government air stations will be available as commercial stations ; and a preliminary survey of certain proposed air routes has been carried out.

In India the Air Board has decided upon the provision of aerodromes on the Calcutta-Delhi-Bombay, Bombay-Karachi, and Calcutta-Rangoon routes.

An Air Board has been formed in New Zealand.

It is understood that the South African Government will decide upon their policy in regard to civil aviation, particularly as affecting air mails and the organisation of an Air Defence Force, as soon as the Director of Air Services arrives.

A company in Bermuda is operating an air service, and is projecting new schemes in the West Indian Islands.

Foreign.—As a consequence of the subsidies granted by the French Government to air transport companies carrying out regular services, a considerable number of routes have been organised and are working regularly.

In Belgium the National Syndicate for the Study of Aerial Transport, which aims at obtaining the support and advice of the whole business community of Belgium, has organised daily air mail and passenger services between Brussels, London and Paris in conjunction with British and French companies respectively.

The municipal authorities of several commercial towns in Holland have shown their appreciation of the country's central position for international air traffic by drawing up plans for local aerodromes.

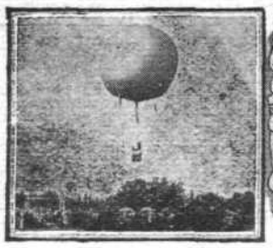
Between September 15 and October 31 the Danish Air Transport conducted an air service between Copenhagen and Hamburg for the carriage of mails, goods and passengers.

Efforts have been made to commence air traffic on a co-operative basis between Switzerland, France and Great Britain.

In the United States the principal effort in civil aviation has been concentrated on the operation of air mail services by the Post Office.

In South America and the Far East no material progress has been made, but British and foreign interests are still endeavouring to develop the operation of air services on a remunerative basis.

Late enemy countries have been handicapped by the restrictions imposed by the Peace Treaty and the petrol shortage, but a number of types of machines have been passed as "civil" by the Inter-Allied Commission of Control, and German companies have been able, in conjunction with Danish, Swedish and Dutch companies, to start air services between Warnemunde, Berlin, Bremen and Amsterdam.



AIRSHIPS

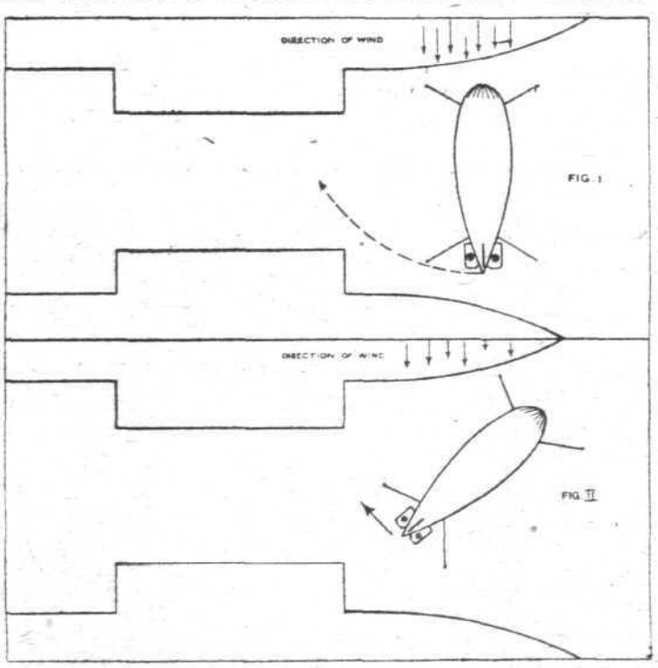
AIRSHIP MOORING AND HANDLING*

By Flight-Lieut. F. L. C. BUTCHER

AT the present time, although an airship can navigate in very strong winds, when in the air, great difficulty is experienced in handling her on the ground, and many opportunities of flying are missed for this reason. It is, therefore, essential to the success of airships in the future that the mooring problem must be solved to enable them to be quite as independent of their sheds as a sea-going liner is of her dry dock. I will endeavour to explain the various methods which have been tried in this country with their advantages and disadvantages.

Handling by Means of Landing Party and Windscreens

I will take as an example the most difficult case usually experienced in housing a large rigid (*i.e.*, a wind blowing across the direction of the sheds), and explain the method employed to get the ship in. The bows are manœuvred into a position as far to windward of the doors as the windscreens allow (*see* Fig. 1), and the stern is walked towards the shed by the men on the after guys. The bows are eased away from the wind, but kept well in hand and not allowed to drift to leeward of the centre line of the shed. When the ship is lying in the position shown in Fig. 2, she is walked bodily astern, the bows being allowed to drift toward the centre line of the shed as the stern moves further into the shed.



When the wind is blowing "up and down" the sheds, the ship may be taken in at either end of the shed, and a considerable difference of opinion exists as to which is the better method. If the ship is taken in through the leeward doors, handling is rendered difficult owing to the bumps and eddies caused by the shed; but in the event of the ship "taking charge," she is more likely to drift clear than if the windward doors were used. By opening the windward doors slightly, and allowing a current of air to blow through the shed, the state of the air on the leeward side is improved to a great extent.

The following is a short description of the German method:—

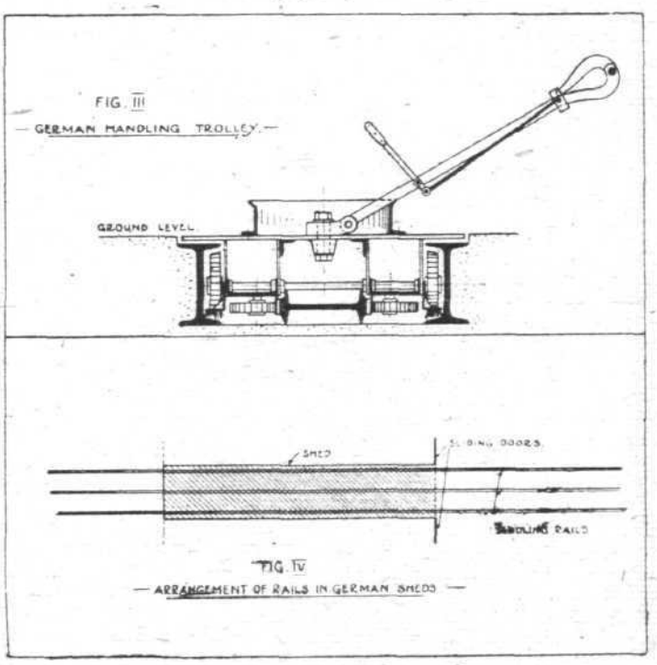
Mechanical Handling

In each double shed four sets of rails are laid down and extend to a distance of about 1,000 ft., as shown in Fig. 4. The rails are of I-section and the set consists of three—one horizontal and two vertical (Fig. 3). The trollies are fitted with four wheels, running inside two vertical rails which take the lifting and upsetting forces, and six wheels running on the horizontal rail to take the side thrust. All wheels are fitted with roller bearings, and brushes are placed both in front and behind the trolleys to keep the rails clear, thus ensuring smooth running.

To take a ship in by this system the following method is employed:—

The ship is landed as near as possible to the end of the rails and walked up to them, rope tackles are led from two trolleys (one on each rail) to the mooring point and hauled taut. The ship is then walked towards the shed by parties of men on the bow hauling rope and fore guys until the stern can be hauled up to the rails and secured in the same way as the bows.

Each trolley is fitted with ropes which are manned by not more than eight men who keep them abreast of the ship. The rest of the handling party are employed on the bow hauling rope, fore guys, and underneath the car and handling frames to prevent the cars from bumping along the ground.



This method of handling is very simple, and undoubtedly superior to our method of handling parties and windscreens; it enables the ships to be taken out in cross winds up to 25 m.p.h., without risk of damage, with two-thirds of the landing party usually employed.

Mooring Over the Sea

The following is a short description of the tackle usually fitted in rigids for riding to a drogue. The general arrangement can be followed by referring to Fig. 5.

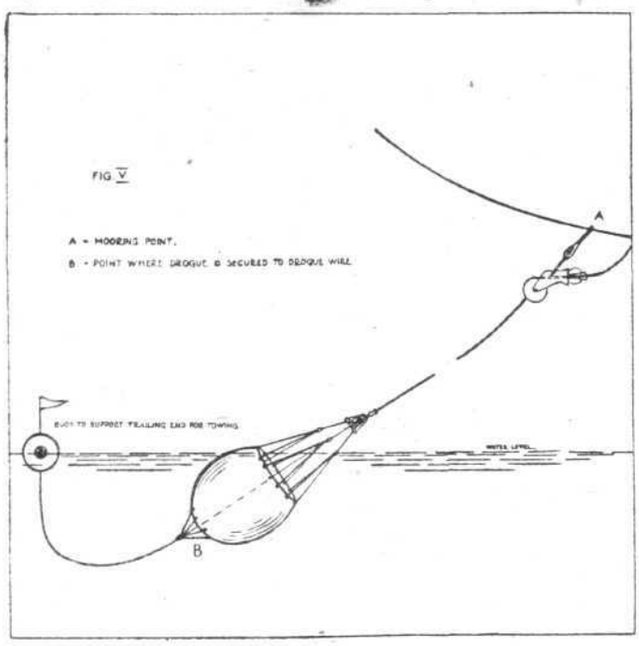
The drogue itself is made out of stout canvas roughly in the shape of a bucket, strengthened round the rim by roping, and eyeletted to take the 12 bridles which, in groups of three, are hooked in the jaws of the drogue slip. The drogue wire is continuous from the bows of the ship through the slip and drogue, which are fitted some 30 to 40 feet from the end, thus leaving sufficient wire trailing behind to be picked up and secured by the towing ship before the drogue is spilled.

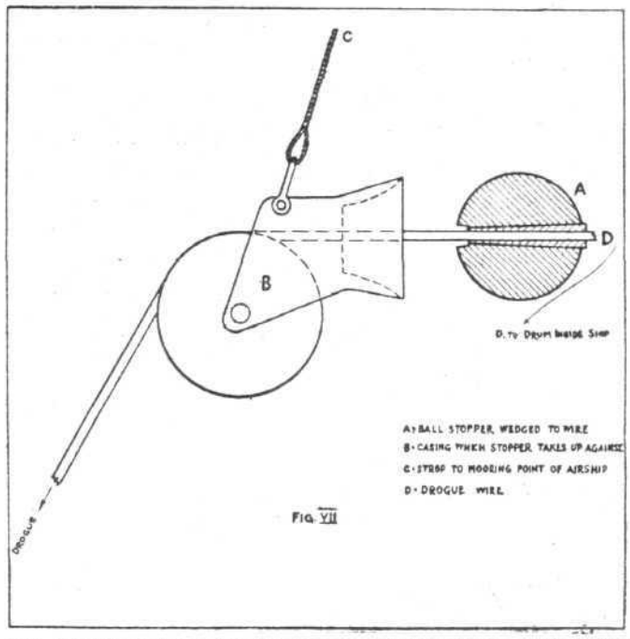
The slip (*see* Fig. 6), which was especially designed for

* Extracts of a paper read before the Royal Aeronautical Society on December 2, 1920.

this purpose, is operated by the impact of a weight sliding down the drogue wire, and can be described as follows: The bridles for the drogue are held by four hooks pivoted on the body of the slip, and which in the normal position are guarded, as shown in the figure, to prevent the bridles from becoming unhooked when the drogue is dropped. These hooks are held in position by extensions or arms with hooked tongues fitting over the rim of a cup sliding on the central guide. The cup is held up by a strong spring, and has a projecting top which is struck when the weight is released and slides down the wire. When the weight hits this projection the cup is forced down against the spring, thus releasing the arms, which immediately fly outwards, due to the strain on the hooks, and the bridles are slipped. It has been found that an 8-oz. weight will spill the drogue when dropped from about 75 ft., though the slip is several feet under water.

The extension of the drogue wire passes through the bottom of the drogue, which is secured to it at this point, so that when the bridles are slipped the drogue turns inside out, enabling it to be drawn out of the water. This fitting was found necessary owing to the fact that the large drogues used hold from 4 to 5 tons of water, and would either have to be cut adrift or lifted bodily out of the water, which is inadvisable owing to the alteration of trim and waste of ballast necessitated. The pull in the drogue wire is transmitted to the ship by means of a ball-stopper wedged on to the wire, which takes up against a block secured to the mooring point with a wire strop seen in Fig. 7. As soon as the pilot decides to ride to a drogue, the required length of wire is reeled off the drum and the ball-stopper wedged securely at a distance from the drogue corresponding to the height at which it is desired to ride, allowing a margin for the sag in the wire. The wire is paid out in a loop from the bows, keeping the drogue still in the ship, until the stopper comes up against the block attached to the mooring point.





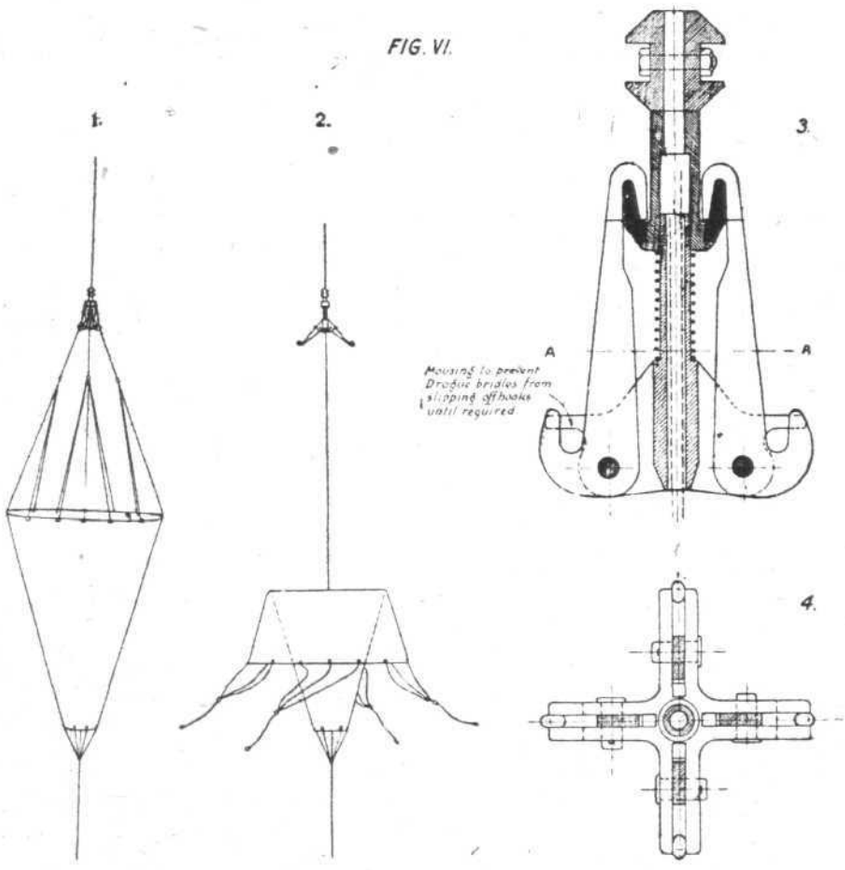


Fig. VI.—Arrangement of improved S.O.B. Slip. 1, Drogue in position for use; 2, Drogue "slipped"; 3, vertical section; 4, Horizontal section through A-A.

The drogue is dropped when the ship is about 100 to 150 ft. above the water and carrying as little way as possible. As the ship drifts with the wind the drogue, by being towed through the water, fills, thus keeping the bows of the ship into the wind.

The drogue, of course, does not hold the ship stationary over the water, but retards its drift to such an extent that even in strong winds the drogue wire can be picked up by surface craft and made fast for towing.

Experiments were carried out by "R.9" and "R.23" over the Wash with drogues in 1918, and it was found that it was only advisable to ride to a drogue in cases of emergency, until some satisfactory arrangement was made to enable the ballast bags to be filled fast enough to counteract the lightness caused by superheating. The airships in both cases were successfully taken in tow by a motor-boat, and the drogue wire secured to a buoy, thus showing that in the case of a broken-down airship at sea it is not a difficult matter to salve her.

This brings up the question of long-distance airship towing by surface craft.

In July, 1919, "N.S.7" was towed from Newcastle to Southend by H.M.S. *Furious*, steaming at 17 knots, and although the tow-rope parted once owing to a faulty splice, a line was lowered and the rope hauled up and made fast again. In winds of over 30 m.p.h. the airship kited when H.M.S. *Furious* was not under weigh, but it was possible to counteract this by running one engine slowly.

This series of experiments show that it is possible for an airship to work in conjunction with surface craft at a considerable distance from her base, and if the parent ship was provided with fuel and gas, the airship could operate for several weeks.

Mooring Over Land

This subject can be divided into two parts—mooring by wires and mooring to a mast.

Three-Wire Mooring System

The incident which led to the reconsideration of mooring an airship by wires occurred in 1917, when "R.9" returned from patrol short of fuel with a strong wind blowing. It was decided to hold her out on the landing ground until the wind moderated, but such difficulty was experienced in keeping her steady that the captain secured the mooring point to three bollards which formed a triangle on the ground. Owing to the satisfactory results obtained, further experiments were carried out, from which the three-wire mooring was developed. An airship was moored to three wires secured to posts or bollards sunk in the ground at the apices of an equilateral triangle, and spliced to a swivel at the mooring point of the ship.

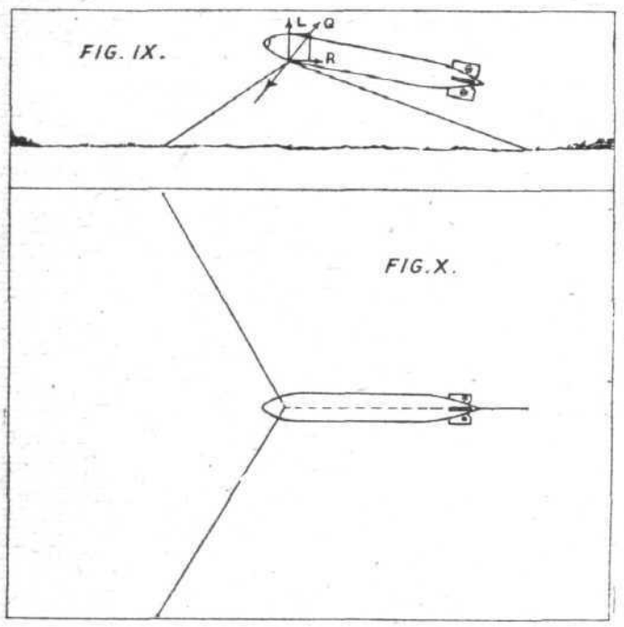


Fig. IX.—Diagram of forces in three-wire system
Fig. X.—Diagram of open hawse position, Mark I

The forces acting on a rigid airship moored to this system may now be considered :—

It was required to maintain the ship at an altitude of 200 ft., pitched slightly down by the stern, as shown in Fig. 9.

The forces acting on the ship at the mooring point are as follows :—.

L = The vertical lifting force composed of the static lift due to the buoyancy of the ship and the dynamic lift due to the angle at which the ship is pitched.

R = The backward force caused by the wind pressure on the hull and cars.

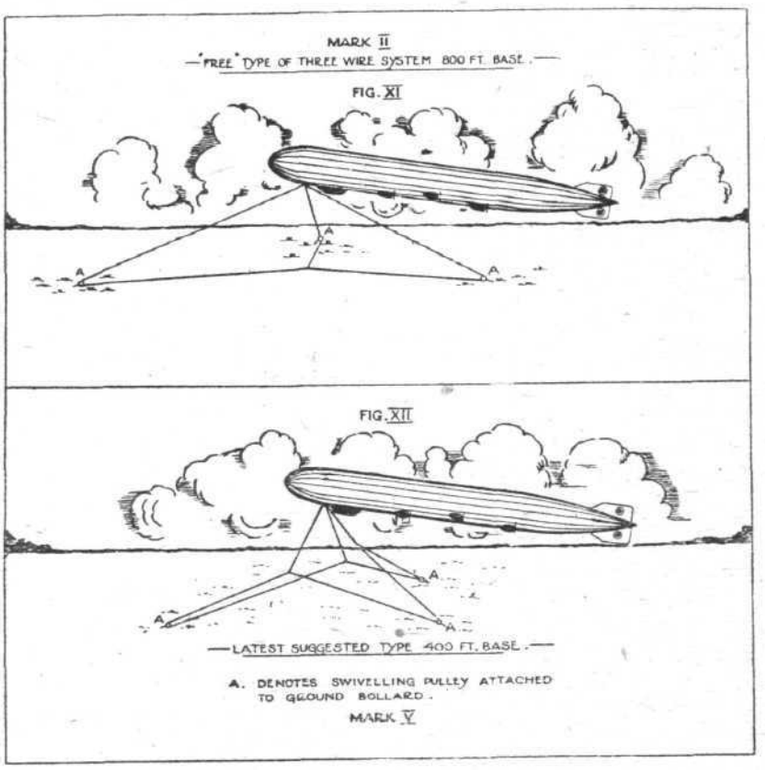
By completing the parallelogram of forces, the resultant force Q was found, and from this the angle of the wire was calculated to give the necessary equal and opposite force when the ship was lying in the "open hawse" position shown in Fig. 10. It was found that the ship, when moored to this system, was driven backward and downward by gusts, causing the leeward wires to slacken and tighten up with a sharp jerk which strained the structure round the mooring point.

Further experiments were carried out in a wind tunnel, with the result that it was decided to moor an airship to a modified system (*see* Fig. 11). The same bollards were used as in the last trials, but the wires were spliced into a central ring and led through blocks on the bollards to a swivel at the mooring point of the ship 200 ft. above the ground. The ring, therefore, was free to move within the triangle formed by the posts, and in this way the wires were kept taut the whole time.

"R.26," an obsolete ship due for deletion, was strengthened in the bows by additional diagonal wiring extending over frames two and three, and when this was completed, was walked out of the shed and secured to the swivel on the mooring system. The trim of the ship was altered until the forward part was sufficiently light to lift the weight of the wires, while the tail was kept in equilibrium and was allowed to rise until the wires were taut.

The ship remained out for 10 days, and the conclusions drawn from this experiment were :—

(1) That the ship rides best at an angle of 4° to 5° down by the stern with about the same number of degrees of helm on in order to keep the bows slightly off the wind. (2) That a quick system of filling the ship with ballast is absolutely essential to prevent the stern from rising to a dangerous angle when superheating. (3) That a ship could ride out any ordinary blow when moored out to the three-wire system, provided that the mooring point is structurally strong. (4) That a ship with a reasonable lift must be used so that the necessary reserve of ballast can be carried to meet adverse changes in weather. (5) That a ship returning to base is usually short of ballast, and therefore gassing and ballasting arrangements must be provided.



The advantage of this method is that it can be prepared in a very short while, at a small cost, and is effective in an emergency. Moorings of this type could be placed at points on an airship route in case a ship is unable to get to the next mooring mast owing to engines failing in a strong wind.

The disadvantages are: (1) The petrol and water hose have to be disconnected and the turns taken out of them when the ship swings, as a hollow swivel was found to be too heavy for use. (2) The difficulty of changing crews and taking in supplies. (3) The large space of level ground required for this system, owing to the size of triangle necessary to keep the ship steady at the "open hawse" position.

"R.34" was moored to this system after landing from her trans-Atlantic flight at Mineola, behaving well and riding steadily. She remained there for four days and rode out some very gusty weather, thus demonstrating the usefulness if the three-wire mooring system in the case of an emergency.

Since that date wind-tunnel experiments resulting in two modifications of this system have been made. In the first, the three wires, instead of being spliced to a ring, are brought to the three corners of a parallelogram; the fourth corner is held by another wire secured to a bollard. It is claimed that by this method the movement of the wires will be damped to a considerable extent without causing jerks on the structure of the ship (Fig. 13).

The second method, shown in Fig. 12, has been developed because, in modern streamline ships, wires from the mooring

point to a triangle of 800 ft. base would foul the forecar when the ship swung. The base in this case is 400 ft., and theoretically better results will be obtained than with an

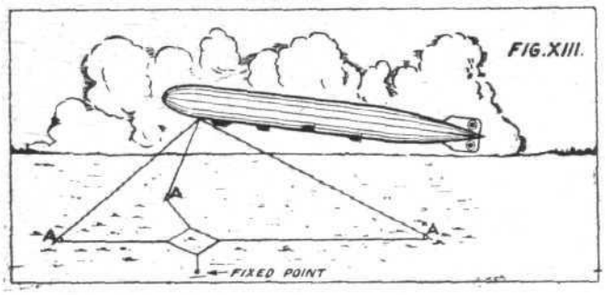


Fig. XIII.—Modified "free" three-wire system, 800 ft. base, Mark IV. (A) Denotes swivelling pulley attached to ground bollard

800 ft. base, but neither of these modifications have been tried on a full scale.

Other Methods

In the summer of 1918 a great number of S.S. Zero type airships were used to escort merchant convoys as a protection against submarines, and, owing to the small shed accommodation available, were moored out at sub-stations along the coast. A tall wood bordering on a good landing field was selected as a site for the station, and a clearing made in the centre of it sufficiently large to hold the ship; this clearing was connected to the landing field by a lane through which the ship could be walked.

To moor a ship in the clearing the guys were taken out at right angles to the centre line and secured to trees. Two additional guys were fitted to patches on the top of the envelope to prevent excessive rolling and made fast in the same manner. The car was ballasted down until it rested on the ground, and the tail held down by a rope to weights on the ground. This method was in use at all small stations situated near the coast, and in many cases winds of 40-50 m.p.h. were weathered without damage to the ships. Regular patrols were carried out from these mooring stations, and when repairs were needed the ship was flown back to base and another substituted.

Mooring to a Mast

Attempts were made to moor out non-rigid airships to a mast designed at Farnborough and erected at Kingsnorth. The top of the mast revolved and consisted of a hollow cone, the base of which was padded to fit round the nose of the airship. This cone was pivoted at its apex, and a balancing weight was fitted on a short arm on the opposite side of the pivot. The nose of the ship was strengthened and a mooring wire spliced into it.

When it was necessary to moor out an airship the nose was brought as near as possible to the cone by the landing party, and the mooring wire led through the padded ring over a block at the apex of the cone and down to a small winch, which, when operated, hauled the nose of the ship into the cone. This method proved satisfactory in light or steady winds, but in gusty weather, when the movement of the ship was rapid, a bending stress was set up in the fabric just behind the ring; this wrinkled one side of the nose and put a corresponding tension on the other, which tore the fabric after a short while.

Trials were also carried out at Barrow in 1918 with a small non-rigid moored to the top of a mast and secured to it at the point where the fore guys are fitted, but the ship rolled badly, and the following system was evolved from it.

Barrow Mast Mooring System for Non-Rigids

In this case the ship is attached at two points on opposite sides of the nose to the two sides of a crutch mounted on a vertical mast; this crutch is built solid with the mast, which is free to turn a ball-and-socket bearing at its base, while it is supported just below the crutch by six guys fastened to one part of a roller bearing, the other part being solid with the mast. The envelope is fitted with ring patches at the points of attachment consisting of a circular steel plate with a ring bolt through the centre sufficiently free in the plate to allow the ship to turn in the vertical plane. This steel plate is held in position by eight wires, and backed up by wires leading to the same number of patches stuck on the envelope. The space between the back of the ring and the envelope is fitted with a rubbing pad to prevent the envelope from being injured by chafing.

The two sides of the crutch on the mast are fitted with circular pads which correspond to the curvature of the bows of the ship, and are parallel with the patches described above. Two small hand-operated winches are also fitted opposite to the holes in the circular pads. Before bringing a ship to the mast it is turned so that a line drawn through the pads would be at right angles to the direction of the wind, then the ship is walked as close as possible to the mast by the handling party. A wire led from another small winch at the foot of the mast through a block in the bottom of the crutch is secured to the mooring point of the ship, and the ship hauled down until two men, one stationed on each bow, are able to secure their winch wires to the ring bolts on the envelope. By hauling in on these winches the ring patches are brought hard against the pads on the bows, and the ship is secure. To keep the ship as nearly as possible in equilibrium, chains are made fast to the car and allowed to trail on the ground; thus, when the ship becomes light, extra chain is lifted, and if the reverse happens and she commences to fall, more weight of chain is supported by the ground.

Experiments were carried out at Barrow-in-Furness with an S.S. Maurice Farman type non-rigid of 70,000 cub. ft., which was moored out for eight days successfully. Although the winds experienced during this period were light, the experiment proved the value of this system, and further tests were carried out at Pulham, by which it was proved that a non-rigid could remain moored out in winds of over 40 m.p.h. without sustaining damage.

Experiments with Rigids

Approval was given in 1918 for the construction of a mast. The mast consisted of a steel tower with a revolving top, and was erected at Pulham. The bows of "R.24," an old type of airship, were strengthened for this experiment. The bows of the ship were fitted with a ball supported by steel tubes projecting about 6 ft., and on the revolving mast head was a socket in which this ball was held, thus allowing the ship to pivot up and down about the nose, but no fore and aft movement was possible. Gas, water and electric light mains were led up the mast and into the ship through a hatch in the bows, and access to the keel was arranged in the same way.

"R.24" was taken out of the shed and secured to the mast by hand, the first part of the experiment being to ascertain what weather she could stand, and for what length of time the ship could remain moored out continuously. She remained out for 21 days before being brought back to the shed, and after a fortnight's work on small improvements which had been found to be necessary, was taken out again. This time she was able to remain out for 42 days continuously in all weathers, and the highest wind experienced was 45 m.p.h. During this time she behaved very well, riding easily and remaining steady in the direction of the wind. Two men were on watch in the control car the whole time, and one on the ground to turn on the water to fill the ballast bags if she became light, or gas up if she became heavy. By means of these gas and water mains it was an easy matter to counteract all changes in buoyancy, however rapid, caused by rain or rise and fall of temperature. The ship rode best at an angle of 0° to 4° down by the stem, but the trim did not have nearly such a marked effect on the stability as in the case of the three-wire system. These trials proved that a rigid airship can remain safely moored to a mast in winds up to 45 m.p.h. in spite of rain, sun and the general deteriorating effect of the weather.

Landing at a Mast

After these trials had been completed successfully, the ship was again brought back to the shed for minor alterations before carrying out the flying and landing tests. The following method was employed: On the ground a wire rope was led from a kite balloon winch through the mast and socket on the revolving top and laid out along the ground to a distance of 350 ft. to leeward. The ship's wire was coiled on a drum inside the bows and the end led through the projecting ball and weighted with a 40 lb. sandbag. "R.24" was flown to the vicinity of the mast with the ordinary flying crew, and after having been ballasted up about 300 lbs. light, the end of the ship's wire was lowered until it could be shackled to the mast wire. Directly the two wires were secure, the after-engine was run "astern" and the ship hauled down to the mast by the winch until the ball on the nose entered the socket on the mast and was locked in position. This landing was accomplished in 11 mins. from the time the ship's rope was dropped to the time she was secured to the mast, and a total of seven men were employed on the landing gear. The wind on this occasion was under 10 m.p.h., the trials were successful, and it was decided to carry out further

experiments by easing the ship away from and hauling her back to the mast in stronger winds.

A few days later this was done in a wind of 25-28 m.p.h., but as the winch was broken down the wire had to be manned by a party of men, which was a severe handicap, owing to the time lost between the orders and their execution. The ship yawed from side to side and showed a tendency to override the top of the mast, but was secured several times without damage.

Modifications have since been made to the mast and system in general, and it is hoped to carry out exhaustive trials with one of the 33 Class rigids in the near future.

Conclusions Drawn from the Above Experiment

(1) That rigid airships can be moored out in safety in this country. (2) No technical difficulties exist in re-fuelling, gassing and ballasting at the mast.

Advantages of Mooring Mast System

Mast mooring has several advantages, namely: (1) The ship can be moored to a mast with very little buoyancy; in fact, the bows can be actually heavy, provided that the stern is light enough to remain in correct trim. (2) A ship will be able to land at a mast and re-fuel before continuing her journey or patrol, and in strong winds will be able to remain moored until the weather moderates sufficiently to enable her to be taken into the shed, in the event of major repairs being necessary. (3) The mast forms an excellent support for the gas, fuel and water mains, which otherwise would have to be lifted by the ship. (4) A very small number of men are required to secure the ship.

Uses of Mooring Masts

The commercial airship route of the future will have sheds, used as docks, at each terminus, and masts at which the airships can be landed to discharge passengers and cargo. The intermediate stopping places will consist of a mast and small plant for making gas, and carrying out any minor engine repairs which the ship may require before proceeding on her journey. By this means it is hoped that airships will be rendered as independent of the weather as a sea-going ship, and will keep to scheduled sailings.

ROYAL AERONAUTICAL SOCIETY NOTICES

Lectures.—Owing to the advent of Christmas there will be no further meeting until January 20, 1921, which will take place at 5 p.m., instead of 5.30 p.m., when the Right Hon. Lord Montagu of Beaulieu, K.C.I.E., C.S.I., A.M.Inst.C.E., A.M.I.Mech.E., will read a paper on "The Cost of Air Ton-Miles Compared with other forms of Transport."

Council.—Owing to the third Tuesday in the month falling so near to Christmas no meeting of Council will be held in December. The next meeting will therefore take place at the Society's Office, at 5 p.m., on Tuesday, January 21, 1921.

Christmas Holidays.—The Society's offices, including the Library, will be closed from Thursday evening, December 23, to Tuesday morning, December 28.

Air Ministry Load Factor Committee.—At the request of the Air Council, Lieut.-Col. M. O'Gorman, C.B., and Capt. Geoffrey de Havilland, O.B.E., A.F.C., have been nominated to represent the Society on the reconstituted Air Ministry Load Factor Committee.

Library.—The following books have been received and placed in the Society's Library:—"Rigging, the Erection and Trueing-up of Aeroplanes," by F. W. Halliwell; "The Airplane," by Frederick Bedell; "Practical Aeroplane Construction," by Frederick T. Hill, A.F.R.Ae.S.; "Jane's all the World's Aircraft, 1920," by C. G. Grey.

W. LOCKWOOD MARSH,
Secretary

THE LONDON-CONTINENTAL SERVICES

FLIGHTS BETWEEN DECEMBER 5 AND DECEMBER 11, INCLUSIVE

Route‡	No. of flights*	No. of passengers	No. of flights carrying Mails	No. of flights carrying Goods	No. of journeys completed†	Average flying time	Fastest time made by	Type and No. (in brackets) of Machines Flying
						h. m.		
Croydon-Paris	4	1	1	3	3	2 40	Airco 16 G-EAPT (2h. 18m.)	A.16 (1), B. (2), G. (1).
Paris-Croydon	9	7	4	8	4	3 2	Airco 16 G-EALU (2h. 40m.)	A.16 (3), A.18 (1), B. (4), G. (1).
Cricklewood-Paris ...	3	12	—	3	3	3 29	H.P. G-EAMA (3h. 25m.)	H P. (2).
Paris-Cricklewood ...	4	19	1	4	3	3 48	H.P. G-EAMA (3h. 28m.)	A.4 (1), H.P. (2).
Cricklewood-Brussels ...	4	2	1	3	2	2 22	—	A.4 (2), A.9 (2).
Brussels-Cricklewood ...	3	—	2	2	1	2 25	—	A.4 (1), A.9 (2).
Totals for week ...	27	41	9	23	16			

* Not including "private" flights. † Including certain journeys when stops were made *en route*.
‡ Including certain diverted journeys.

A.4 = Airco 4. A.9 = Airco 9 (etc.). Av. = Avro. B. = Breguet. Br. = Bristol. Bt. = B.A.T. F. = Fokker. Fa. = Farman F.50. G. = Goliath Farman. H.P. = Handley Page. N. = Nieuport. P. = Potez. Sa. = Salmson. Se. = S.E.5. Sp. = Spad. V. = Vickers Vimy. W. = Westland.

The following is a list of firms running services between London and Paris, Brussels, etc., etc.:—Air Post of Banks; Air Transport and Travel; Co. des Grandes Expresses Aériennes; Handley Page Transport, Ltd.; Instone Air Line; Koninklijkie Luchtvaart Maatschappij; Messageries Aériennes; Syndicat National pour l'Étude des Transports Aériens; Co. Transaérienne.

Berlin–Essen Services Prohibited

A SEMI-OFFICIAL announcement issued in Berlin makes it clear that the recent prohibition by the Inter-Allied Aeronautical Commission, of German air services between Berlin and Essen and other places within the fifty kilometres zone is not due to a new decision on the part of the Ambassadors' Conference, but to a decision taken long ago by the conference not to allow German military aircraft in the neutral zone.

The Aeronautical Commission considers that this decision is also applicable to German aircraft which were sold after the War to German firms and released for purposes of civilian flying. Negotiations are now proceeding on the subject.

German Activity in Colombia

UNDER the auspices of the German house, Giessecken and Co., a company has been formed in Colombia with a view to maintaining an air service between Barranquilla and Girardot, 450 miles along the Magdalena river by means of Junkers waterplanes. Each machine is to be arranged to carry a ton of merchandise and three passengers.

Design of Internal Combustion Engines

DR. WILLIAM J. WALKER of Manchester will read a paper on "Thermodynamic cycles in relation to the design and future development of internal-combustion motors" at the meeting of the Institution of Mechanical Engineers, at Storey's Gate, S.W., on Friday, December 17, 1920, at 6 p.m.

FLIGHT

AIRISMS FROM THE FOUR WINDS

FORTY years' record is claimed for the sudden wintry weather which visited this country last week-end. Fourteen to sixteen inches of *undrifted* snow by the rule *is* a bit steep for the Eastern Counties. But from personal experience this is not exaggerated by a quarter of an inch. Wonder how many ordinary folk outside the district so selected can visualise what that depth of snow really means? Fortunately, the cold was not quite so intense below as aircraft reported up above. These observations by our pilots supply valuable data for the Meteorological Office, so that even record cold-snaps have their advantages beyond merely affording opportunities for skating, tobogganning and other exhilarating outdoor sport.

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THAT the earth-surface cold was reflected in the higher air regions was confirmed by aeroplane ascent from Andover on Sunday at 11.30 a.m. The reading at 7,450 ft. above the ground was 1 deg. below zero, 22 degs. below the normal figure at that level for this time of year. Again on Monday, from observations made, very low readings were registered in the upper air during another ascent from Andover at 2.20 p.m., the thermometer falling from 28 degs. near the ground to 18 degs. at 2,930 ft., 5 degs. at 7,500 ft., 10 degs. below zero at 10,980 ft., and 15 degs. below zero at 12,890 ft.

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WHEN rabies was again introduced into this country soon after the Armistice, it was repeatedly claimed that this abominable crime was carried through by some 'plane pilot who brought over an infected animal in his machine—possibly by way of pleasing some fair admirer. Of proof there was, apparently, none forthcoming, and therefore, although suspect at the time, aviation was entitled to the benefit of the doubt, and the case was in the public mind labelled as "not proven." This last week, however, we have a clear case of dog-importation without proper licence into this country by way of the air, and it does seem curious that, having regard to the other means of importation available, this method should have been selected, except for the purpose of evading the restrictions. It matters little whether the dog so carried was infected or not. It is the principle which is at stake, of holding the whole population up to the possibilities of hydrophobia for the sake of satisfying what amounts to selfishness of the most acute order. The defendant, a prominent Newcastle resident, as a result, was fined £20 and £2 2s. costs at the Croydon Police Court, the exact charge being for bringing an Alsatian wolf-hound by air into this country from France on October 20 without a licence. As the Ministry of Agriculture reported that twice in the past year imported dogs had been found to be infected with rabies, this apparent attempt to escape quarantine for an imported dog is all the more serious. Is it not about time that the offence were made a case for imprisonment without the option of a fine? Another point is, how comes it that any aeroplane firm accepts such a responsibility, having regard to the possible consequences if the animal is landed here unobserved? Possibly the explanation is that it is a French house that knows not of the restrictions. So far as the French authorities are concerned, they do not bother themselves, leaving it to our officers to check arrivals. This is a freightage aviation can well do without, and therefore, failing some arrangement between the Home and French authorities to issue licences at the port of embarkation, the sooner the conveying of dogs by air into this country is definitely forbidden the better.

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MORE aerial post innovations are reported in connection with the trans-continental air mail system. In Hungary the current 10-kronen postage stamp has been surcharged 3, 8 and 10 korona respectively, and overprinted Legi Posta for use on air mail letters. Switzerland has distinguished the 30 centimes postage stamps which frank aerial correspondence between Basle and Frankfort by overprinting them with the device of a winged propeller in red. Meanwhile, latest advices from Bucharest state that the alleged Rumanian air post stamps, overprinted "P.A.R. or "Posta Aeriana, 1920," are unauthorised, and have never been used in connection with the official air post in Rumania.

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AGAIN, when is the British air-mail stamp to materialise? It may appear a very small matter, but we are of opinion that even this apparently minor innovation would materially assist forward patronage of the air mail. Why do not the authorities start a series? If an "overprint" at first, all the better. Philatelists are keen buyers, and they would be no mean assistance in pushing along to popularity air-post letters.

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THE wireless telephone had an opportunity of demonstrating its usefulness during the snowstorms of the past week. The *Handley Page*, with four passengers and a heavy load of goods, piloted by Lieut. R. H. Macintosh, on its way from Paris on Monday, after successfully getting through one snowstorm in France and another off the south coast, ran into fog near London, and the pilot lost his bearings. By means of his wireless telephone, he was able to get into touch with the aerodrome, and received directions which enabled him to bring the machine safely into the airport.

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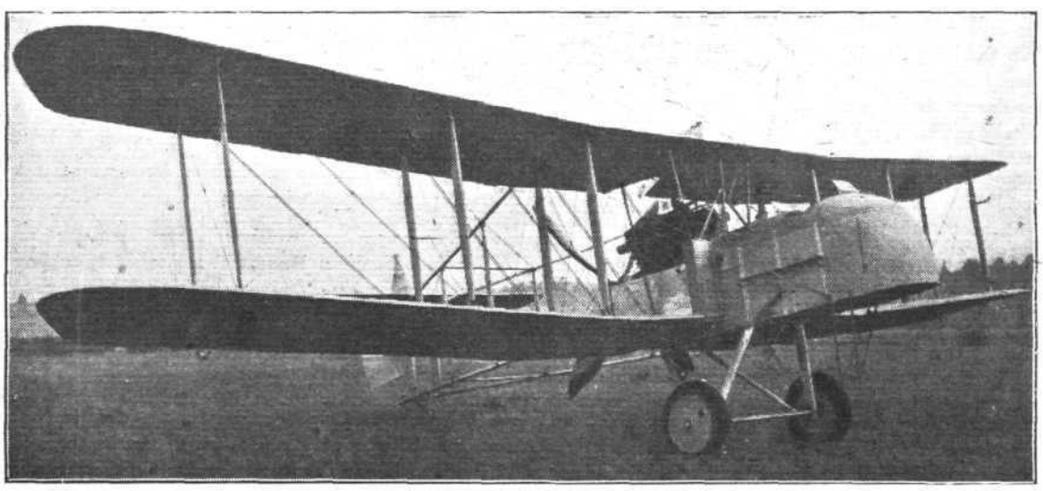
AN appropriate note is struck by the names which are appearing on the new villas along Plough Lane, near the Croydon aerodrome. Among those recently noted were "Aero View" and "Up Yonder."



The Revival of the "Pusher."— There are probably a good many people who have been under the impression that the old "pusher" type of aeroplane was dead. Messrs. Vickers, Ltd., appear to be among those who think otherwise, for they have just brought out a new school machine which is of the pusher type. The cockpits are arranged to reproduce, as far as possible. "Vimy" conditions, and the newmachine, the "V.I.M." is intended for tuition work preparatory to instruction on the "Vimy."

THE ROYAL AIR FORCE

London Gazette, December 7

Short Service Commission

Flying Officer W. A. Pritt, M.C., resigns his short service commn.; Dec. 8.

The following temp. appointment is made :—

Staff Officer, 3rd Class.—(Q) T. Armstrong (Qr. Mr. and Maj., T.F., Gen. List) is granted a temp. commn. as Capt., and to be Hon. Maj. (April 1, 1918) (substituted for notification in *Gazette* of Dec. 20, 1918).

Flying Branch

Capt. I. P. R. Napier, M.C., relinquishes his temp. R.A.F. commn. on appt. to T.F., and is permitted to retain his rank.

Sec. Lt. (Hon. Lt.) A. B. Taylor relinquishes his temp. R.A.F. commn. on appt. to T.F., and is permitted to retain rank of Lt.

Transfd. to Unemployed List.—Lieut. B. H. Matthews, Sept. 16, 1919. Capt. T. J. C. Martyn, M.C., A.F.C.; Nov. 1, 1919 (substituted for *Gazette*, Nov. 14, 1919).

The surname of Lieut. B. E. Turney is as now described, and not Gurney, as in *Gazette*, Nov. 23.

The Christian names of Lieut. Humphrey Dight Humphreys are as now described, and not as in *Gazette*, Nov. 26.

The surname of Lieut. C. H. Stilwell is as now described, and not as in *Gazette*, Nov. 30.

The notification in *Gazette* of Nov. 12 concerning Sec. Lieut. G. H. Clarke is cancelled, *Gazette*, Mar. 14, 1919, to stand.

Administrative Branch

Flying Officer (actg. Flight Lieut.) M. J. Langley, D.F.C., relinquishes the actg. rank of Flight Lieut. on ceasing to be empld. as Flight Lieut.; Mar. 31.

Lieut. O. V. Lee to be Lieut. from (A. and S.) Sept. 8, 1919 (substituted for *Gazette*, Oct. 14, 1919).

Transferred to Unemployed List.—Lieut. W. Ricketts; May 4, 1919 (substituted for *Gazette*, Aug. 26, 1919). Sec. Lieut. C. H. Philip; Sept. 23, 1919 (substituted for *Gazette*, Oct. 14, 1919).

Technical Branch

Flying Officer J. Durward relinquishes the grading for pay and allces. as Flight Lieut. on ceasing to be empld. as Flight Lieut.; July 25.

Transferred to Unemployed List.—Sec. Lieut. G. W. Martin; April 21, 1919. Capt. S. J. Waters; Aug. 1, 1919 (substituted for *Gazette*, Feb. 3). Lieut. F. D. Brooker; Sept. 26, 1919.

Memoranda

Twenty-one Cadets are granted hon. commns. as Sec. Lieuts. with effect from the date of their demobilisation.

Lieut.-Col. (actg. Col.) I. Curtis, M.A., A.M.I.M.E., relinquishes his temp. R.A.F. commn.; Oct. 1.

London Gazette, December 10

Flying Branch

Flying Officer W. G. C. Hackman (Lieut., Hamps. R.) relinquishes his temp. R.A.F. commn. on return to Army duty; Oct. 27.

Sec. Lieut. (Hon. Lieut.) C. V. Carr relinquishes his temp. R.A.F. commn. on appt. to the T.F. Reserves, and is permitted to retain the rank of Lieut.

The following are transferred to Unempld. List and are restored to the Active List, Nov. 23 :—Lieut. J. Valentine; June 29 (substituted for *Gazette*, July 6). Sec. Lieut. B. Dixon; March 25 (substituted for *Gazette*, April 6).

The following are transfd. to Unemployed List.—Sec. Lieut. J. Cocksedge, Sept. 24, 1919. Lieut. R. C. D'A. Gifford; Oct. 8, 1919. Lieut. G. A. Kennedy; Oct. 11, 1919. Sec. Lieut. H. F. Gates; Oct. 17, 1919. Lieut. H. Morden-Wright, M.C.; June 24.

Lieut. N. Fielden relinquishes his commn. on account of ill-health caused by wounds, and is permitted to retain his rank; Aug. 13 (substituted for *Gazette*, Aug. 20).

Lieut. R. H. Dryden relinquishes his temp. R.A.F. commn.

Administrative Branch

Lieut. (Hon. Capt.) F. C. McBride relinquishes his temp. R.A.F. commn. on appt. to the T.F. Reserves, and is permitted to retain the rank of Capt.

The following are transfd. to Unemployed List.—Sec. Lieut. (actg. Lieut.) H. T. Weston; March 5, 1919. Lieut. E. Pope; Oct. 9, 1919.

Technical Branch

Capt. G. I. N. Deane relinquishes his temp. R.A.F. commn. on appt. to T.R. Reserves, and is permitted to retain his rank. Sec. Lieut. W. A. Frame relinquishes his temp. R.A.F. commn. on appt. to T.F., and is granted rank of Lieut. Lieut. W. B. Jones is transfd. to unempld. list; Sept. 13, 1919.

Dental Branch

Lieut. D. Campbell is transfd. to unempld. list; March 28, 1919 (substituted for *Gazette* April 11, 1919).

Memoranda

Flight Lieut. (Hon. Sqdn. Leader) T. Armstrong (Qrmr. and Hon. Maj., R. Welsh Fus.) relinquishes his temp. R.A.F. commn. on return to Army duty; Nov. 16.

The following Cadet is granted an hon. commn. as Sec. Lieut., with effect from date of his demobilisation :—184729 L. V. Price.

AVIATION IN PARLIAMENT

Surrender of Aeronautical Material

SIR F. HALL, in the House of Commons on December 6, asked the Lord Privy Seal whether Article 202 of the Peace Treaty with regard to the surrender by Germany of military and naval aeroanutical material has yet been carried out; if not, will he say when it is expected that the delivery of such material will be completed; and whether, in the meantime, the manufacture or importation of aeronautical material by Germany has been entirely stopped.

Mr. Bonar Law (Leader of the House) : The terms of the Article referred to have not been completed entirely, but satisfactory progress has been made and every effort is being made by the Inter-Allied Commission to secure its complete fulfilment. The answer to the third part of the question is in the affirmative.

Committee of Imperial Defence

VISCOUNT CURZON asked the Prime Minister how many meetings of the Committee of Imperial Defence have been held since the Armistice, and how many meetings of the same body have been held this year; and whether the forthcoming Naval, Military, and Air Force Estimates will be submitted to the Committee for consideration before being laid before Parliament.

The Prime Minister : The answer to the first and second part of the question is one meeting, though perhaps I should remind the hon. Member that, as the House has been informed on several occasions, by far the greater part of the work of the Committee of Imperial Defence is performed by Sub-committees and conferences of that Committee; as regards the last part of the question, I am not, at the present time, in a position to specify the method by which the Estimates in question will be considered by the Cabinet.

Commander Bellairs : Would it not facilitate the work of defence if the three staffs of the fighting Departments were to get together ?

The Prime Minister : That is one of the suggestions which has not merely been considered but agreed to.

Armed Forces in Ireland

MR. DEVLIN, on December 8, asked the Secretary of State for War what is the present cost of maintaining the Army in Ireland; and what is the cost of keeping in that country the auxiliary and the various other armed forces of the Crown.

Sir A. Williamson : The estimated monthly rate of expenditure on the troops in Ireland is now approximately £1,200,000, and on the Royal Air Force £37,000. As explained on October 26 in answer to a similar question put by the hon. Member for Rothwell (Mr. Lunn), practically all the militia forces in Ireland are part of the regular standing Army of the United Kingdom and the cost of keeping them in Ireland is in most respects no greater than that of keeping them elsewhere.

Royal Air Force Timber

MR. REMER asked the Secretary of State for Air whether he is aware that one of his officers, Mr. Gates, attached to the Contracts Department of the Air Ministry, is negotiating to buy English ash trees unsawn at 7*s.* 6*d.* per cubic foot; for what purpose are these required; and whether he is aware that the Timber Supply Department of the Board of Trade has recently sold all the surplus aircraft ash at 5*s.* 6*d.* per cubic foot, sawn into planks.

Mr. Churchill : No negotiations are in progress for the purchase suggested in the question. Arrangements are, however, being made for the transfer of a quantity of selected ash planks from the Controller of Timber Supplies to the Air Ministry.

Air Raid Victims Compensation

SIR H. NIELD asked the Chancellor of the Exchequer how soon the proposed Grants Commission for the apportionment of the Reparation Fund to those who have suffered loss of limbs or property by reason of the operations of enemy aircraft will be set up; how is it proposed to constitute the personnel of such Commission; is he aware that there are persons whose injuries are now of five years' standing who have not received any payment and whose position is one of extreme poverty and hardship; and can he make any arrangements for payments on account.

Mr. Chamberlain : It is useless to appoint the Commission until the Reparation Commission can give some indication of the probable date on which payments by Germany for reparation (over and above prior charges, such as the repayment of the coal advances and the cost of the armies of occupation) can be expected. My hon. friend will be aware that the first of a series of meetings to determine the amount to be paid by Germany and the method of payment to is be held next week in Brussels. I have no funds out of which payments on account could be made.

Aerial Agreement with France

THE text of an agreement between France and Great Britain regarding aerial navigation has been published in the *Official Gazette*. This agreement will cease to be in force as soon as the International Convention for aerial navigation drawn up by the Peace Conference becomes effective. The agreement provides that the two Governments will permit the free passage of private and commercial aircraft, while reserving the right to establish prohibited areas for military reasons. All aircraft must carry a log and a traffic permit. The pilots must have a certificate showing their qualifications. The use of wireless apparatus without special permission is forbidden. The respective authorities reserve to themselves the right of examining aircraft on arrival and departure.

Excess Profit Duty and Hangar Building

W. ALBAN RICHARDS AND CO. recently made an application to the Board of Referees in respect to increasing the statutory percentage on the business of manufacturing hangars, but the Board made no order.

To Our Readers

As we continually receive complaints from readers that they experience difficulty in obtaining their copy of FLIGHT promptly each week, we draw their attention to the subscription form which is printed on page xviii of the current issue. If this is sent, accompanied by the appropriate remittance, to the publishing offices, 36, Great Queen Street, W.C., it will ensure FLIGHT being received regularly each week upon the day of publication.

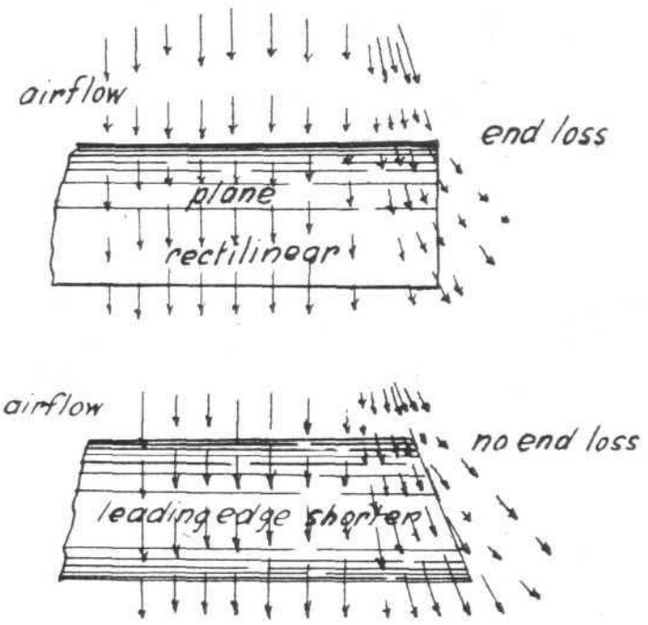
FLIGHT

MODEL AEROPLANES

NOTE.—All communications should be addressed to the Model Editor. A stamp should be enclosed for a postal reply

Wing Tips—Why they are Swept Forward

A READER has written pointing out that in most of the designs given in FLIGHT the wings have longer trailing than leading edges, and he enquires the reason. The accompanying sketch renders the matter clear; with a rectilinear plane the air, indicated in the sketches by arrows, has a tendency



to leak endwise from the plane. By shortening the leading edge, however, the airflow, whilst maintaining its original line of motion, is prevented from leaking over in the manner shown in the lower sketch. This end loss is known technically as "end loss."

Winding Propellers

IT is unwise to wind new rubber to its full elastic limit. Modellers have frequently written to me complaining of the fact that "the rubber I bought from So-and-So's broke the first time I used it." Investigation has found that the reader has been using well-worn rubber that he knew would stand about 1,000 turns, and upon replacing it with the new has given it 1,000 turns straight away. No rubber can be expected to stand this; the machine should have been given several flights with only 300 turns, several more at 400, and so on up to the limit. With twin-screw machines do not place all the turns on one screw at once; place 100 on one, then 100 on the other, and so on alternately up to the limit.

Dihedral Angles and Warping

A READER complains that he cannot get his model to fly satisfactorily owing to the wing bowing upwards in mid-air. This is chiefly caused by using wood of too small a cross section in relation to the span. It will have been noticed that on nearly all of my models *top* diagonal bracing only is given; this is to prevent the dihedral from flattening out, the wing itself being made sufficiently rigid to remain true when acted upon by air-pressure. A wise disposition of the ribs will often eliminate this flexing difficulty; securing the fabric neatly to each rib acts as a brace, and also prevents flexing or warping. Wings tapering towards the wing-tip also have a less tendency to distort when in motion. I have found results so impaired when a multiplicity of bracing is employed that I consider it advisable to place a little extra weight in the wing construction and do away altogether with wing bracing other than maintaining or keep threads.

When a wing is found to warp it is necessary to first find the correct position of the main plane, and then brace it top and bottom. For planes more than 30 ins. span and under 3 ft. 6 ins. (assuming a constant aspect ratio of 6 to 1), the cross section should be $\frac{5}{64}$-in. × $\frac{5}{32}$-in. The spans should be tapered off cantilever fashion toward the tips. The dihedral should not be more than $\frac{1}{18}$th of the span, that is to say, the versed sine of the curve should not be more than 1 in. for every 15 ins. span.

Compressed Air Motors

MR. H. BAILEY, of Leicester, writes as follows:—

"After a great deal of experimental work with compressed air models, I was much impressed with the exhausting pumping up of the container of models needing high pressures necessary to obtain free flight. So much so, I determined if possible to design a model requiring a minimum amount of energy in pumping up, combined with a maximum result in performance.

The completed model under actual flying tests has turned out highly satisfactory. I have briefly outlined particulars of same below:—

"Particulars.—Tractor mono. O.A. length 36 ins.; span, 40 ins.; air screw, 14 ins.; dia., 20⅝ pitch; air container, 18 ins. × 2 ins. (3¼ ounces); engine, 3 cylinder stationary (⅜ in. bore × ½ in. stroke), 1¼ ozs. (less tape); total weight of model 8¼ ounces (the container was buit up of the lightest brass foil obtainable (purchased locally) 003.

"The foot pump used with model under test was 1⅛ in. bore × 10 ins. stroke, with 20 pump strokes in the container. The model rose off short grass, this showing the minimum number of pump strokes to obtain flight off ground.

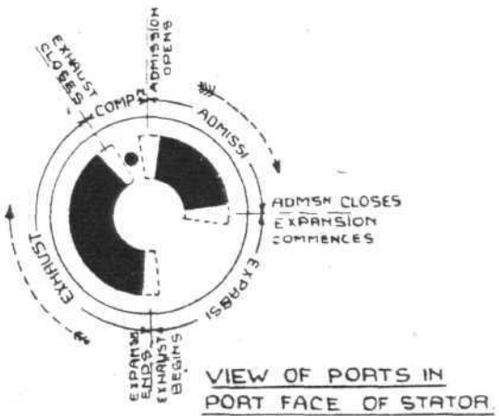
"On 60 pump strokes the model rapidly climbed off ground to a height of 30 to 40 ft., making a stable and powerful flight of 25 seconds. Such results, I think, are worthy of mention. Has such a model as herein described been built and tested, the results publicly published? [Yes, many times; 71 seconds is the record.—ED.]

"Personally, I consider the 25 seconds duration obtained could be improved upon, providing a reducing valve was used to throttle down the engine during the initial high pressure in the container. Unfortunately, I have been unable to find information relating to same to enable me to carry my tests further.

"I should be more than pleased to receive any suggestions as to the most useful form of reducing valve which could be used with the above plant."

Replies to Correspondents

A. M. (Leicester).—I append herewith a drawing of a suitable valve for your steam plant. The angles of cut-off and inlet are most important.



VIEW OF PORTS IN PORT FACE OF STATOR

A. M. C. (Blandford).—I duly dispatched the drawing. Please write if in doubt or difficulty.

SIDE-WINDS

IN an action brought against the Madison Motor Car Co., U.S.A., by the Wire Wheel Corporation of America, for infringement of the American equivalent of the Rudge-Whitworth Triple Spoke Wheel Patent 1537–09, the patent was declared to be valid, and the wheel, in spite of the fact that it was a 4-spoke wheel and not a 3-spoke wheel, was declared to be an infringement. This decision, which is believed to be final, following the upholding of the patent in France and Germany in actions which have been fought, in these two countries, makes this triple-spoke wheel patent one of extreme importance.

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AT the Shipbuilding and Engineering Exhibition at the Kelvin Hall, Glasgow, on the stand of Messrs. William Beardmore and Co., great interest was shown in the airship passenger car which is proposed for "R.36," the giant rigid airship now completing in the firm's Airship Construction Works at Inchinnan; also in the airship engine car. There were other and smaller airship components also shown, such as the control board in the commander's cabin of a modern "rigid."

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THE exhibit which inquestionably aroused the greatest curiosity on the part of the general public was the P.K. mechanical hand and arm, which the firm is manufacturing in quantities in a corner of its Temple Works Anniesland. A demonstrator was in attendance, and crowds thronged round him at all hours of the day.

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MORE remarkable even than the growth in welding repairs—and it may be mentioned that Barimar, Ltd., did as many as 70,000 such jobs for Government departments alone during the War—is the variety of work in connection with general engineering which now presents itself. In addition to thousands of units which Barimar receive during the year, urgent telegrams arrive daily describing repairs required in connection with engineers' shop equipment and plant, and in many cases these repairs are carried out in record time to prevent a shut-down of works. It will be good news, therefore, for the engineering industry in the provinces that Barimar, Ltd., have now opened service depôts in Birmingham, Manchester, Newcastle and Cardiff, at each of which their special metallurgical process will be in operation. The existence of these depôts will save customers at a distance the expense and delay—and the latter is often considerable in these abnormal times—of sending broken parts or scored cylinders up to the headquarters of Barimar in London. In cases where it is impossible to send heavy units to London, or to one of the Barimar branches, expert welders are despatched, with portable plant, to make the repairs on the spot.

LEGAL INTELLIGENCE

The Importation of Dogs

JOHN FRANCIS CHALLONER OGLE, of Kirkley Hall, Ponteland, Newcastle-upon-Tyne, was summoned at Croydon Police Court on December 11 for bringing an Alsatian wolfhound from France to England by air on October 20 without a licence.

Prosecuting for the Surrey County Council, Mr. M. E. Reed stated that the Board of Agriculture viewed the case as serious, as in the past two years two imported dogs had been found to be infected with rabies.

The Chairman (Sir Arthur Spurgeon) elicited that the authorities in France did not question the exportation, and apparently the responsibility for enforcing the regulations was left to the police or Customs officers at the air port on arrival. A fine of £20, and two guineas costs, was imposed.

PUBLICATIONS RECEIVED

Fifty Years of Travel: By Land, Water and Air. By Frank Hedges Butler, F.R.G.S. London: T. Fisher Unwin, Ltd. Price 21*s.* net.

Jane's All the World's Aircraft. Edited by C. G. Grey. London: Sampson Low, Marston and Co., Ltd. Price £2 2*s.* net.

Soaring Flight: A Simple Mechanical Solution of the Problem. By Lieut.-Col. R. de Villamil (late R.E.). London: Charles Spon, 10, Lower James Street, W. 1. Price 1*s.* 6*d.* net.

The Airplane. By Frederick Bedell, Ph.D. New York: D. Van Nostrand Co., 8, Warren Street. Price 3 dols. net.

Technical Note No. 17. *Italian and French Experiments on Wind Tunnels.* By Wm. Knight. National Advisory Committee for Aeronautics, Navy Building, Washington, D.C., U.S.A.

IMPORTS AND EXPORTS, 1919-1920

AEROPLANES, airships, balloons and parts thereof (not shown separately before 1910). For 1910 and 1911 figures see "FLIGHT" for January 25, 1912; for 1912 and 1913, see "FLIGHT" for January 17, 1914; for 1914, see "FLIGHT" for January 15, 1915; for 1915, see "FLIGHT" for January 13, 1916; for 1916, see "FLIGHT" for January 11, 1917; for 1917, see "FLIGHT" for January 24, 1918; for 1918, see "FLIGHT" for January 16, 1919; and for 1919, see "FLIGHT" for January 22, 1929.

	Imports.		Exports.		Re-Exportation.	
	1919.	1920.	1919.	1920.	1919.	1920.
	£	£	£	£	£	£
January ...	555,989	2,323	57,571	32,752	—	697
February	453,822	9,320	57,972	68,932	—	—
March ...	704,424	2,092	72,716	67,600	400	—
April ...	97,662	5,918	25,433	148,484	—	—
May ...	136,631	761,425	38,428	237,627	—	400
June ...	1,410	491	41,526	300,572	—	61,150
July ...	136,463	51,020	41,290	286,646	—	—
August ...	67,292	116	60,581	130,774	—	2,544
September	172,192	386	65,349	302,802	—	—
October ...	132,243	445	87,635	106,954	500	913
November	44,713	9	67,831	165,607	7,200	—
	2,502,841	833,545	616,332	1,848,750	8,100	65,704

AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations: cyl. = cylinder; I.C. = internal combustion; m. = motors

The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

APPLIED FOR IN 1919

Published December 16, 1920

20,009. G. A. CHADDOCK. Aircraft. (153,950.)
21,440. W. R. GREATHEAD. Direction and speed indicators. (153,989.)
21,870. P. H. HEFFORD. Radial-cyl. I.C. engines. (153,999.)
24,247. E. E. BROWN and D. J. MOONEY. Metal construction for aircraft. (154,035.)
25,280. BOULTON AND PAUL and J. D. NORTH. Fuselages and tail surfaces. (154,041.)

APPLIED FOR IN 1920

Published December 16, 1920.

3,024. A. E. and R. BLACKBURN. Apparatus for producing aerial flight effects. (154,101.)
9,775. E. BUGATTI. Dash-boards for aeroplanes, etc. (141,693.)
14,674. L. POIRMEUR. Rotary explosion engines. (143,931.)
24,444. J. K. DELANO. Starting-apparatus for aeroplane engines. (152,007.)

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